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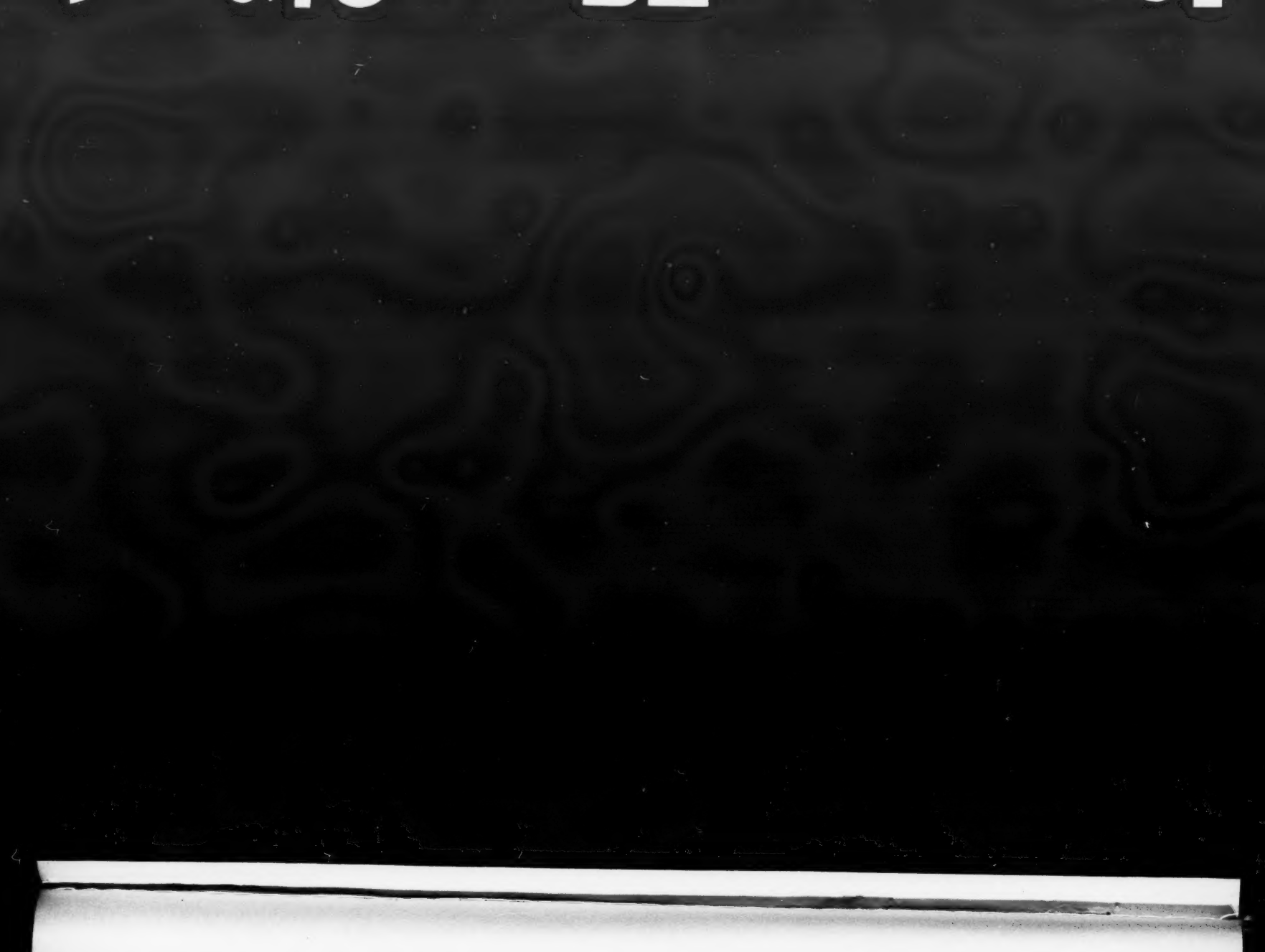

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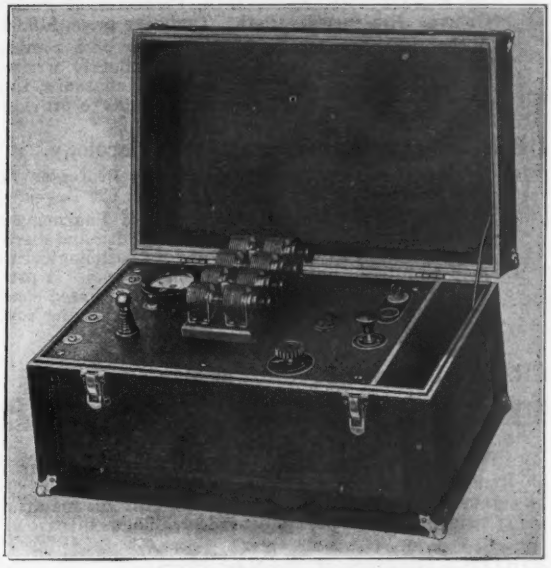

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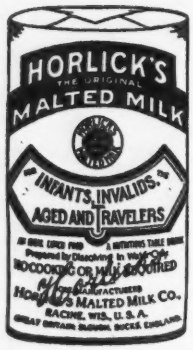

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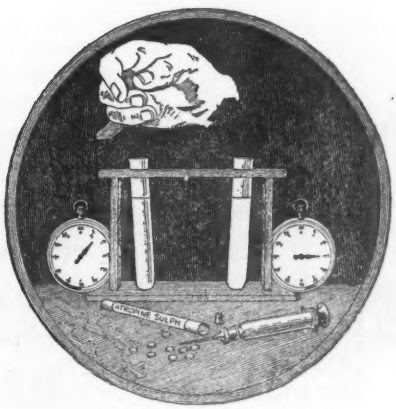

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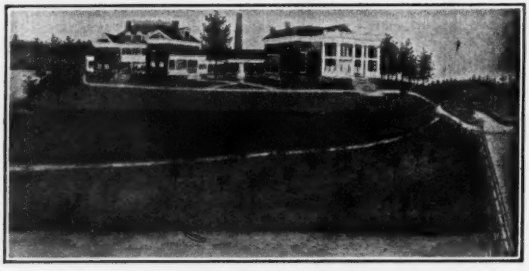

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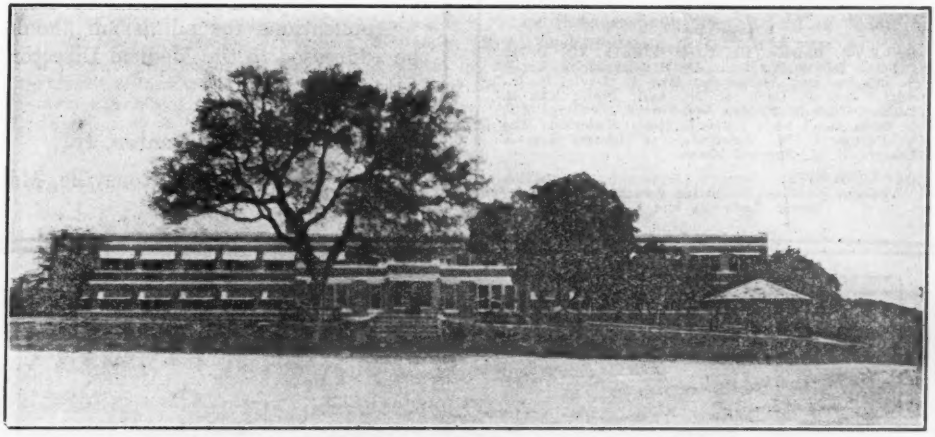

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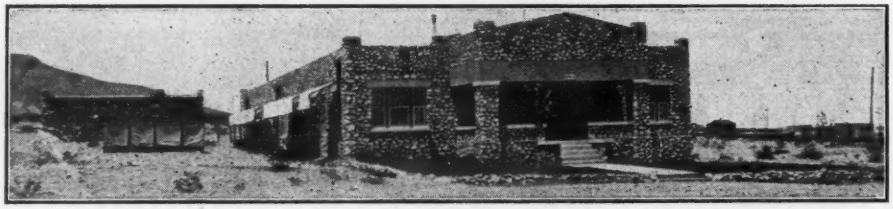

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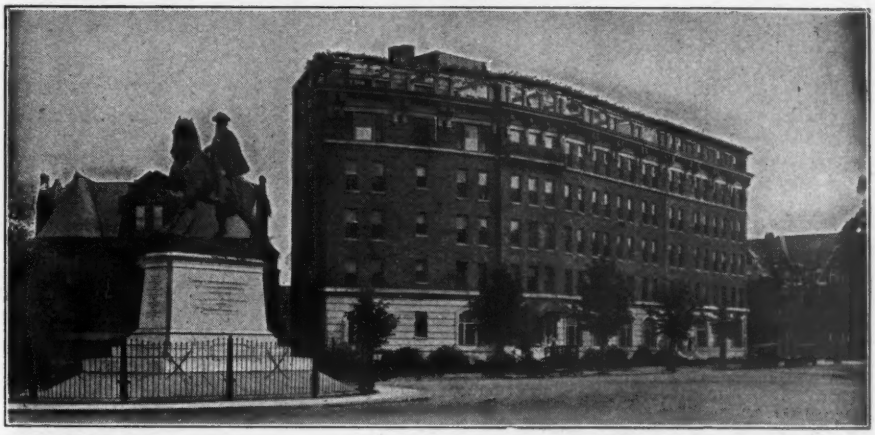

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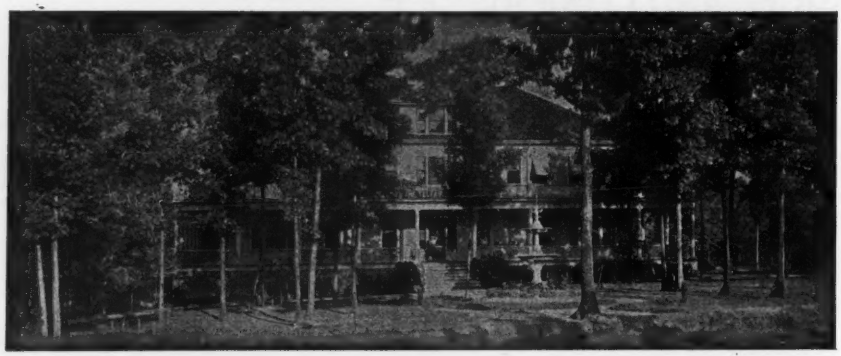

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MEDICINE

INTERNAL DISEASES, PEDIATRICS, NEUROLOGY, DIAGNOSTIC METHODS, ETC.

ANALYSIS OF ONE HUNDRED CASES OF HYPERTENSION*

By J. HEYWARD GIBBES, M.D.,
Columbia, S. C.

Hypertension is still one of the enigmas of modern medicine. It is a subject about which we know a great deal, and yet concerning which we are conscious of the inadequacy of our information. Chemical and physical theories have been advanced to explain it, ideas of a compensatory reaction to changed mechanical conditions have been entertained, and the relationship of hypertension to modifications of renal function has been investigated and discussed elaborately. Janeway[1] gave an interesting review of this subject in 1913, tracing its history from the day of Bright in 1836, and setting forth the theoretical background of hypertension of 13 years ago. In 1920 Barker[2] gave a full consideration of the question from the clinical point of view. Such reviews leave us with the feeling that our knowledge is lacking in exactness, that a mass of observation is before us, but that our experimental approach to the matter has been checked on all sides.

Hypertension, as we know it clinically, is certainly a state which results from long-continued causes, and which is associated with tissue changes of a gradually developing character. Practically every effort at an experimental reproduction of such conditions has been unavailing. As a typical example of the unsatisfactory results obtained, we mention the conflicting reports of Cash[3] and Anderson[4], the former reporting a rise of blood pressure in dogs when the amount of kidney substance in the animals was reduced to the point of seriously interfering with renal function, while the latter found that no elevation of blood pressure resulted. Of course a successful experimental approach to the problem must be found, for, until it is, much of our knowledge must be classed as speculative.

The recent work of Major[5] is of a most encouraging nature. The idea that hypertension might be the result of a metabolic disturbance has been advanced as a theoretical consideration by many clinical observers. Major's experiments with the guanidin bases have shown the potent pressor action of these substances that are normally present in the blood, tissues, and urine as end products of purin metabolism.[6 7] He has demonstrated the mechanism of their action on the nerve-muscle structure of the arterioles, has indicated their retention in clinical cases of hypertension with increasing elimination as the blood pressure falls under treatment, and has gone a long way toward explaining the occurrence of hypertension in the absence of arterial or arteriolar thickening and changes in renal structure. The relatively long duration of the pressor effect of the guanidin bases[8], 0.1 to 0.2 gram per kilogram of body weight administered hypodermically or intravenously resulting in a doubling or trebling of the blood pressure in dogs, with the rise of the pressure lasting from 4 to 5 hours, would seem to make it possible to produce a state of chronic hypertension, closely simulating clinical conditions. From this hopeful beginning it is fair to assume that the whole subject will be greatly clarified in the next few years.

In the meantime, clinical observations remain of interest and of some importance. The follow-

*Read in Section on Medicine, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., November 9-12, 1925.

ing review of 100 cases with blood pressures above the normal is presented with the full realization that it does not bring new light on the subject, but with the idea that it might tend to focus attention upon some of the important clinical features. The data were collected from 100 patients chosen seriatim from my private records, and in no sense were the cases selected.

As regards the symptomatology of hypertension, 49 of these patients complained of symptoms that might be interpreted as referable to the cardiovascular-renal system, while 51 presented complaints that would be commonly referred to other organs or systems of the body. This is of importance as showing that the lead given by the patients themselves as to the character of their troubles was misleading in more than 50 per cent of the cases.

The family history of cardiovascular-renal disease was interpreted as positive in 55 cases, negative in 23, and classed as unsatisfactory in 22. It will be seen that in the 78 patients who furnished what was thought to be reliable information concerning their immediate families the incidence of such disease in them was 70 per cent. This is a close approximation of the statistics collected by O'Hare[9], who found a positive family history in as high as 76 per cent of his cases. While family histories must be unreliable at best, these findings would indicate an important relationship between heredity and hypertension.

The following table of conventional statistical data is of importance as regards age, occupation and weight. The race and condition of the patients are obviously of little moment because of the great preponderance of whites in my office records and because of the fact that at the average age of 54 years those who are married naturally far outnumber those who are single.

TABLE I.

Conventional Statistical Data

Age—	
Average	54 years
High	76 years
Low	29 years
Race—	
White	97
Colored	3
Sex—	
Male	59
Female	31
Condition—	
Married	62
Single	14
Widowed	24
Occupation—	
Sedentary	73
Active	27
Weight—	
Over	51
Under	12
Normal	29

The past history seems to be of little importance. Naturally, the incidence of acute infectious diseases was high, but in no instance was there reason for thinking that they had a bearing on the patient's present illness. It is interesting to note that scarlet fever occurred with relative infrequency. Pyogenic infections had been recognized by the patients in 55 per cent of the cases, gonorrhea was admitted by 14 of them, syphilis acknowledged by 2, and a history of alcoholism obtained in 4.

TABLE II.

Personal History

Acute Infectious Diseases—	
Measles	53
Mumps	53
Whooping cough	38
Diphtheria	4
Typhoid	22
Pneumonia	6
Malaria	6
Acute rheumatic fever	4
Flu	15
Scarlet	7
Pyogenic Infections—	
Teeth	36
Miscellaneous	19
Total	55
Venereal Diseases—	
Gonorrhea	14
Syphilis	2
Total	16
Alcohol	4

The general symptomatology, aside from the presenting complaint and the present illness, is of interest because of the relatively high incidence of so-called digestive symptoms, constipation, headache or vertigo, and dyspnea and palpitation of the heart. A positive history of the nocturnal passage of urine in 72 patients is most striking, stamping this symptom as the most important lead furnished by the patient as indicating the existence of hypertension.

TABLE III.

Personal History (continued)

Digestive symptoms	23
Constipation	29
Headache or vertigo	21
Cardiac symptoms	21
Nycturia	72

The data collected on physical examination show that cardiac hypertrophy is almost a part of the picture of hypertension, that focal infections are almost universally associated with it, and that hyperthyroidism is practically no part of it. Handel[10] reports the basal metabolism on 20 patients with hypertension, nine of them showing accelerated rates with normal findings in the others. The interpretation of these results is open to question.

TABLE IV.

Physical Examination

Blood Pressure—	
Systolic:	
High	260
Low	140
Average	196
Diastolic:	
High	180
Low	80
Average	103
Heart—	
Large	73
Not large	27
Focal Infections—	
Present	91
Absent	9
Teeth missing	15
Thyroid—	
Active	10
Not active	90

The urinary findings were positive in a surprisingly large number of the cases, there being only one patient whose urine failed to show albumin in at least a trace. But it will be observed that the average output of phenolsulphonephthalein was within the lower limit of normal, indicating that serious interference with renal function was not present in the majority of the cases. Only 2 per cent of the patients had syphilis. In 96 per cent of the cases in whom the eye-grounds were examined arteriosclerosis was found. O'Hare[11] has advanced the idea that cerebral arteriosclerosis might be responsible for hypertension, stating that peripheral arteriosclerosis without retinal arteriosclerosis exists without hypertension, whereas retinal arteriosclerosis is almost regularly found in association with hypertension. However, I have frequently observed advanced retinal arteriosclerosis without hypertension. There can be no doubt of the almost universal association of hypertension with arteriosclerosis, but hypertension is seen clinically at a relatively late stage, and the tissue changes are seen only at the end stages. While Fishberg[12] reports arteriosclerotic changes in the kidneys in all of 72 cases of hypertension, it is impossible to say that one condition is related to the other in a causal way. If there be such a relation, it seems much more probable that the arteriosclerosis results as a compensatory tissue change to a functional hypertension than vice versa.

TABLE V.

Laboratory and Special Examinations

Urine—	
Albumin with casts	96
Albumin without casts	3
Negative	1
Wassermann Reaction—	
Positive	2
Negative	98
Eye-Grounds—	
Arteriosclerosis	73
Negative	3
Not Ex.	24
Phthalein Output—	
High	85%
Low	20%
Average	49%

In the follow-up records on these patients some of the notes extend over a period of years, the longest being eight years, while some of them are only of a few months standing.

TABLE VI.

Cases with Reliable Subsequent Notes

Number	76
Improved	26
Unimproved	29
Dead	21
Causes of Death—	
Myocardial Insufficiency	4
Apoplexy	7
Angina	2
Uremia	4
Pneumonia	1
Unknown	3

In the following table the data of outstanding importance are presented for concise review.

The matter of obesity in its relation to hypertension is receiving more and more attention. It will be seen that 55 per cent of these patients were above their optimum weights, and the findings of Terry[13] and Herrick[14] emphasize the importance of obesity in this condition. Herrick's work, pointing out the syndrome of obesity, hyperglycemia and hypertension, has done a great deal to indicate the ill-effects of the conventional low protein, high carbohydrate diets that have been prescribed for these patients, and as showing the good effects that come from reducing their weights.

In dividing the cases into those which have improved, those which have not improved, and those which have died, certain important prognostic data are obtained.

TABLE VII.

First Summary

Average age	53 yrs.
Pyogenic infections present in	96%
Sedentary occupation	78%
Arteriosclerosis	73%
Heart enlarged	73%
Nycturia	72%
Positive family history	70%
Overweight	55%
Complaint not indicative of hypertension	51%
Average phthalein output	49%
Deaths	21%
Overactive thyroids	10%
Scarlet fever	7%
Alcoholism	4%
Syphilis	2%

It will be seen that the systolic pressure is of little or no prognostic value, whereas, as the diastolic rises and the phthalein output falls the prognosis becomes increasingly grave. The gravity of the prognosis is shown to increase also

TABLE VIII.

Systolic	Diastolic	Age	Overweight	Enlarged Heart
Averages for Total Series				
196	103	53	55%	73%
			Phthalein 49%	
Averages for Improved Cases				
214	97	54	52%	66%
			Phthalein 52%	
Averages for Unimproved Cases				
197	115	51	59%	83%
			Phthalein 39%	
Averages for Deceased Cases				
203	124	54	66%	100%
			Phthalein 34%	

with an excess of body weight. In 82 per cent of the improved cases focal infections were found and removed, in 30 per cent of the unimproved cases this was done, and in only 11 per cent of the deceased cases were focal infections eliminated. It is impossible to estimate the importance of this, but the facts are interesting.

In conclusion, it would seem that the following considerations are of importance:

As regards etiology:

(1) Hypertension is a disease of middle life and beyond, the average age of 100 patients being 53 years.

(2) Heredity plays a prominent part, 70 per cent of the patients from whom reliable data were obtained showing a family incidence of cardiovascular-renal disease.

(3) The practical omnipresence of focal infections, and the improvement associated with their elimination, suggest a contributing responsibility of these infections to hypertension.

(4) Sedentary occupations seem to predispose to this condition.

(5) Adiposity is another contributing factor.

As regards prognosis:

(1) A diastolic blood pressure above 100 gives a bad outlook.

(2) A phthalein output below 40 per cent is unfavorable.

(3) Patients with enlarged hearts do not improve readily.

(4) Adiposity increases the gravity of hypertension.

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Discussion follows paper of Dr. Sprunt, page 422.

ANALYSIS OF SERIES OF CASES MANIFESTING ARTERIAL HYPERTENSION, WITH SPECIAL REFERENCE TO PROGNOSIS*

By THOMAS P. SPRUNT, M.D.,
Baltimore, Md.

One phase of the subject of arterial hypertension of considerable clinical interest is the prognosis.

Some years ago, when careful clinical studies of hypertension were first made, there was great fear of high blood pressure among both physicians and laity. Both recognized the dangers to which such patients were exposed, namely, myocardial failure, renal failure, and apoplexy.

But further study showed that there is a considerable number of relatively benign cases that permit health and a fair degree of activity for many years. As Barker has taught, it is certainly a great mistake to permit the patient to suffer too much from fear. We have in such cases an excellent opportunity for the practice of psychotherapy in the broad sense of dispelling fear, or inspiring confidence and hope, of guiding the patient toward a more hygienic mode of life, and of cultivating in him the ability to face the realities with serenity. In the present state of our knowledge we have come to regard this type of psychotherapy as the most potent and serviceable therapeutic agent at our command.

The prognosis in the individual case is notoriously difficult, but some of the methods that are helpful in arriving at the general impression of the outlook in each case are exemplified in the statistics of this series.

This series of 104 cases is reported from the medical clinic of which Lewellys F. Barker is

*Read in Section on Medicine, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., November 9-12, 1925.

the director and the chief. A number of case records were selected from the years 1918 to 1920 of patients who had shown a systolic blood pressure of 160 or more. All cases, the end results of which were known, were immediately set aside for the analysis, and to these were added other cases in which information was forthcoming of the present status. This method of selection includes naturally all those severe cases in which death occurred while they were under our observation in hospitals, together with those who died soon after leaving our care and with whose physicians or families we were still in correspondence. This would tend to make the mortality in the series of 100 cases rather more impressive than might be expected in a series of 100 consecutive cases.

The routine examination in this clinic is usually thorough. Some of the records in this series suffer comparatively by reason of the fact that they were made during the period of the war, when the number of patients was large and the staff undermanned and overworked. It is not surprising, under the circumstances, that the family histories in some cases were evidently taken hurriedly and perfunctorily and that some of the usual clinical observations were omitted from the records.

In spite of the fact that there was no special interest in the clinic at that time in constitutional pathology, the records of family histories indicate a decided familial trend.

The number of cases analyzed was 104. Of these 73 were men and 31 women. Of the men, 49 are dead and 24 living, while of the women 11 are dead and 20 are living. Some of this rather marked discrepancy in the mortality according to sex is more apparent than real, since the figures do not take into account the duration of the disease. An attempt was made to determine the duration of the hypertension from the time of the onset of symptoms where this was sufficiently clear cut in the records, and the figures show a difference in favor of a longer duration in women. The average duration of life after the onset of symptoms in men was 6.4 years and in women 7 years. Of those cases with hypertension for 10 years or more, there were 8 men (10.9 per cent) and 5 women (16.1 per cent); of those showing a duration of 8 years or more, there were 16 men and 10 women.

Causes of Death.—In 24 of the 60 fatal cases the immediate cause of death is unknown. Of the remainder, 16 died from apoplexy, 10 from heart failure, 6 from renal insufficiency, 1 after an operation, 1 from pneumonia, 1 by suicide, and 4 with a severe anemia.

It may be of some interest that 4 per cent of the series suffered from a severe non-hemorrhagic anemia and that 6.6 per cent of the deaths were due to this cause. In two of these cases the picture was that of a typical primary "Addisonian" anemia, in the other two the clinical features were not typical.

The total number of patients who had suffered from apoplectic strokes or later had this complication was 22.

Status of the Patients Now Living.—Among the 44 patients alive for from 5 to 7 years after the examinations on which these figures are based, 30 are symtomatically fairly well, in that they suffer no serious inconvenience and are able to attend to their ordinary duties; 14 are "sick," and 3 have had paralytic strokes.

ETIOLOGY

We shall pass over the etiology briefly.

Those who are interested in the application of fundamental biological principles to the study of medicine cannot fail to be interested in constitutional pathology. From the viewpoint of the biologist all developed characters are the result of the interaction of factors of heredity with factors of environment. Many biologists are now convinced of the overwhelming importance of the factors of heredity in the development of lower forms of life and of its great importance also in the development of man. It is believed that the germ plasm may contain determiners of abnormal traits as well as of normal traits, and if the environmental factors are suitable for development of the abnormal traits disease may result.

Some of the evidence in favor of the view that inheritance factors are of importance in the occurrence of arterial hypertension are: (1) The fact that certain families may contain several members who develop arterial hypertension relatively early; (2) certain physical and mental traits that seem characteristic of such families and that are so often found in victims of hypertension; (3) the frequency of hypertension in victims of migrain, an exquisitely hereditary disorder usually associated with a labile vasomotor nervous system; (4) the repeated demonstrations by actuarial and statistical methods so well brought out by Pearl in his little volume, called "The Biology of Death," that the duration of life in man is largely determined by his inherited physico-chemical make-up, and the experiments

on lower animals indicating that longevity is a trait that behaves exactly like a Mendelian character in inheritance studies. If inheritance is of such importance for the duration of life it would seem to be equally so in the determination of the chronic diseases that bring life to an end. It is not improbable, then, that constitutional inferiorities of the vascular, the nervous, the endocrin and the metabolic systems may play an important role in the pathogenesis of arterial hypertension.

This view does not detract in any way whatever from the great importance of the study of environmental factors upon which a rational and causal therapy must be based, nor from the study of the details of the metabolic changes through which the inherited or acquired tendencies may be mediated.

Constitution.—In this series, with its rather imperfect family records, hypertension or its complications were noted in 35 cases. A definite nervous trend appeared in 16. It is of some interest from the standpoint of longevity that in 16 of the cases both parents lived beyond the age of 70 years. In some of these instances the patients themselves were well up in the sixties, with promise of several years more of life. In this group of 16 cases there was a family history of hypertension in 8, of migrain in 1 and of nervousness in 1.

From the standpoint of the individual a neuropathic constitution was present in 66 of the 104 patients; 55 were above the standard weight zone, and 30 were below the standard weight zone. An endocrin dyscrasia, slight or well marked, was present in 34 cases, and 22 of the patients had suffered from migrain.

Acquired Factors of Possible Importance.—In the history of previous illnesses syphilis is recorded 8 times, typhoid 24 times, pneumonia 8 times and tonsillitis 32 times.

No focal infections were noted in 16 of the cases. Of the others, 72 presented some form of oral sepsis of greater or less degree, and 10 showed some grade of chronic tonsillitis.

From the standpoint of general hygiene, 37 of the patients had undoubtedly been of the restless, intense, active type, who work too hard and play too little, 40 were habitual users of tobacco, 19 gave a history of moderate alcoholism, and in 11 the use of coffee or cocacola was rather excessive.

The age incidence is of interest. Seventy per cent of the cases occurred between the ages of 40 and 60. In the third decade there were 3 cases, in the fourth 6 cases, in the fifth 30 cases, in the sixth 40 cases, in the seventh 23 cases, and in the eighth decade only 2.

With the exception of those pertaining to the age, the figures above given are not particularly impressive. They probably do not greatly differ from those that might be expected in a similar series of any chronic condition at the same time of life.

PROGNOSIS

The Arteries.—It is widely believed that arterial hypertension usually begins as a functional symptom that leads gradually sooner or later to organic changes in the arteries. Hence the condition of the arteries is one of the most helpful prognostic features.

In this series the arteries were studied (1) by palpation of the peripheral vessels, particularly the radial and the brachial arteries; (2) by palpation and inspection of the temporal arteries; (3) by roentgenoscopic examination of the aorta; (4) by the examination of the urine and by the usual functional renal tests in the attempt to form an opinion of the state of the renal arteries, and (5) by ophthalmoscopic inspection of the retinal arteries.

Chart I shows the relative frequency with which arteriosclerotic processes were noted in these different portions of the arterial system.

In five cases no definite organic arterial changes were demonstrated, and with the exception of one case they seem to show no evidence of a progression in the hypertensive process.

CHART I.

CIRCULATORY SYSTEM—ARTERIES

	Sclerotic	Negative	No Report
Radial	73	19	12
Temporal	35	21	48
Aorta	82	14	8
Renal	86	13	5
Retinal	38	32	34

Retinal hemorrhages.....10

NO ARTERIAL CHANGES IN FIVE CASES

D.—Age, 49; blood pressure, 170/110; living, 4½ years; well; latest pressure, 160/110.

C.—Age, 44; blood pressure, 170/100; living, 6¼ years; well.

R.—Age, 49; blood pressure, 178/106; living, 5 years; well, except heminaopsia 136/.

Mrs. S.—Age, 47; blood pressure, 170/105; living, 5½ years; 130/70, "well" after two thyroid operations.

Mrs. V. P.—Age, 54; blood pressure, 205/105; living, 6 years; cerebrospinal symptoms 240/.

It is generally believed that the condition of the small arterioles throughout the arterial tree is of the greatest importance in the determination of an arterial hypertension, and it may be that the height of the diastolic pressure is indicative of the extent of the changes in this portion of the vascular bed.

It would certainly seem from the figures in Chart II that the finding of a diastolic pressure of 150 millimeters or more is of very serious import. Half of the patients were dead within a few weeks, nine out of the ten in two years. The patient who is living after seven years is an excellent example of our inability to make a satisfactory prognosis in all cases. Almost every sign of prognostic importance was unfavorable in his case, yet after seven years he is as well or even apparently in better health than he was at the time of the first examination.

A glance at the chart will show that when one chooses a diastolic pressure of 130 as the point of interest the outlook is considerably less serious, though more than half of the patients have died within two years.

CHART II.

PROGNOSIS (DIASTOLIC PRESSURE)

Diastolic Pressure (150 or more—10 cases)—	
Dead within 2 months	5
Dead after 1 year	2
Dead after 2 years	1
Living 7 years (224/150)	1
Diastolic Pressure (130 or more—29 cases)—	
Dead within few months	11
Dead after 2 years	6
Dead after 3 years	4
Dead after 5 years	2
Living after 5 to 7 years	6
Improved	3
Worse	1
Unchanged	2

Cases with marked retinal changes are those that showed in addition to the usual signs of sclerosis of the retinal arteries hemorrhages or exudates in the retina. Six of the 10 patients with this serious indication show the usually expected fatal result within two years, four of them, however, are living from 4½ to 5¼ years later, and three of these enjoy a fairly satisfactory condition of health (Chart III).

CHART III.

CASES WITH MARKED RETINAL CHANGES

W.—Age, 40; blood pressure, 225/174; died 6 days; apoplexy.
V.—Age, 62; blood pressure, 225/138; died 4 months; heart.
J.—Age, 46; blood pressure, 210/135; died 2 months.
C.—Age, 54; blood pressure, 230/120; died 1 year.
Mrs. E.—Age, 29; blood pressure, 218/134; died few months; kidney.
S.—Age, 51; blood pressure, 218/144; died 2 years; apoplexy.
Mrs. R.—Age, 50, blood pressure, 230/126; living 5 years; poor vision; 220/110.
Mrs. C.—Age, 44; blood pressure, 210/145; living 5 years; "much better."
Miss B.—Age, 25; blood pressure, 205/110 (retinitis); living 4½ years; "excellent health."
Mrs. S.—Age, 60; blood pressure, 215/120 (diabetes); living 5¼ years; "poor health," "weak heart."

From the standpoint of the heart, eight patients who showed definite signs of myocardial insufficiency, however slight, all died within four years. Of the 15 patients with precordial pain nine died within 3½ years. Six patients with slight pain are living 5½ to 7 years since the examination; of these, four are definitely improved, and one has suffered a paralytic stroke.

About half the cases presented a systolic murmur that seems to be of no importance from a prognostic standpoint. The six patients with a diastolic murmur referable to the aortic valve have died, most of them within two years. One patient lived for six years and died of pernicious anemia. The two patients with gallop rhythm have died, one in one year after the examination, the other three years later. Of the two patients with auricular fibrillation, one died, after two months, at the age of 69, of apoplexy; the other, a woman of 62 years of age who showed short runs of fibrillation in the electrocardiogram, is living six years later and reported to be in fine health. One patient with paroxysmal tachycardia, a case of exophthalmic goiter, blood pressure of 170/105, is living 5½ years later, although there is some impairment of the myocardium. After two thyroid operations, the blood pressure is now reported to be 130/70. One patient with a right bundle branch block lived for three or four years.

To indicate the significance of impaired renal function upon the prognosis, cases were chosen whose phenolsulphonephthalein output was less than 40 per cent in two hours, or whose nonprotein nitrogen of the blood was 40 or above. The serious significance of this finding is indicated in the chart (Chart IV). Here again there were three patients that indicate the difficulty in prognosis in individual cases.

CHART IV.

IMPAIRED RENAL FUNCTION

Mrs. P.—Age, 63; Ph., 32:9; blood pressure, 212/180; died 1 day.
Miss M.—Age, 50; Ph., 31; blood pressure, 172/112; died 6 months; heart.
W.—Age, 40; Ph., 21; U. N., 25; blood pressure, 225/175; died 6 days; apoplexy.
P.—Age, 48; Ph., 10.8; N. P. N., 68; blood pressure, 220/150; died 2 months; uremia.
Miss T.—Age, 60; Ph., 10; blood pressure, 163/95; died 11 days; kidney.
J.—Age, 46; Ph., 32:55:4; blood pressure, 210/135; died 2 months.
S.—Age, 62; Ph., 29:45; blood pressure, 175/92; died 6 years (sudden).
M.—Age, 29; Ph., 13:18:12; N. P. N., 78; blood pressure, 152/118; died 5 months.
L.—Age, 53; Ph., 38; blood pressure, 180/100; living 6½ years; improved.
Miss B.—Age, 25; Ph., 38; U. N., 20.3; blood pressure, 205/110; living 4½ years; improved; 170/220.
Dr. N.—Age, 64; Ph., 30; N. P. N., 40; blood pressure, 210/110; living 4½ years; improved.

Ph.—Phthalein.
U. N.—Urea nitrogen.
N. P. N.—Non-protein nitrogen.

As favorable indicators, it would seem that a patient with normal urine or with a normal aorta

on roentgenoscopic examination may be considered to have a good prognosis.

Of the 14 cases with normal urine all lived for three years (Chart V). One of them died of pneumonia at the end of this time; another died after five years, presumably from pernicious anemia. Nine are living and many of them practically well.

CHART V.

CASES WITH NORMAL URINE

Mrs. H.—Age, 60; blood pressure, 210/98; died suddenly 2-4 years.
H.—Age, 54; blood pressure, 166/115; died pneumonia 3 years.
F.—Age, 53; blood pressure, 176/105; died suddenly 4 years.
G.—Age, 59; blood pressure, 178/90 (myelitis, anemia, achylia); died anemia 5 years.
S.—Age, 62; blood pressure, 175/92; died suddenly 6 years.
G.—Age, 35; blood pressure, 164/108; living, well 6¼ years; 153/100.
D.—Age, 49; blood pressure, 170/110; living 4½ years; 160/110.
Mrs. U.—Age, 56; blood pressure, 190/100; living (toxic goitre) 7 years; 175/120.
Mrs. R.—Age, 49; blood pressure, 174/98; living, much better 6 years; 160/80.
Mrs. T.—Age, 57; blood pressure, 200/116; living (stroke after 6 years) 6½ years.
C.—Age, 44; blood pressure, 170/100; living (psychasthenic state) 6¼ years.
S.—Age, 38; blood pressure, 184/112; living, well 4¾ years.
E.—Age, 44; blood pressure, 172/100; living, well 6½ years; 175/100.
R.—Age, 40; blood pressure, 178/106; living, well except heminanopsia, 5 years; 136?

Of the 14 whose aortas were considered normal, 11 are living and in very satisfactory condition (Chart VI).

CHART VI.

CASES WITH NORMAL AORTAS

Mrs. L.—Age, 30; blood pressure, 245/155; died 1 year.
Mrs. T.—Blood pressure, 180/110; died 4¾ years; severe anemia.
M.—Blood pressure, 152/118; died 5 months; kidney.
G.—Age, 35; blood pressure, 164/108; living 6¼ years; well; 153/100.
D.—Age, 49; blood pressure, 170/110; living 4½ years; 160/110.
E.—Age, 40; blood pressure, 160/90 (psychasthenic); living 6½ years; 160/90.
P.—Age, 50; blood pressure, 194/118; living 5¾ years; 195/110.
Mrs. S.—Age, 47; blood pressure, 170/105 (toxic goitre); living 5½ years (after 2 operations); 130/70.
R.—Age, 68; blood pressure, 180/100; living 6 years; well; 166/84.
C.—Age, 44; blood pressure, 170/100; living 6¼ years; well.
A.—Age, 47; blood pressure, 180/100; living 4 years; well; 190.
E.—Age, 46; blood pressure, 160/94; living 6½ years; well; 128/80.
R.—Age, 40; blood pressure, 178/106; living 5 years; well; 136?
T.—Age, 53; blood pressure, 228/122; living 4¾ years; 200.

Age.—The grouping of the patients according to age is of some interest. Our figures would indicate definitely that the prognosis is relatively bad in those in whom the hypertension develops at an age earlier than the usual age period. Of the nine patients in this group six have died within three years (Chart VII).

CHART VII.

PROGNOSIS (AGE)

Miss B.—Age, 25; blood pressure, 205/110; diagnosis, Art. Scler. and Chr. Nephr.; previous duration, 2 years; living 4½ years? "well;" 170-220.
M.—Age, 29; blood pressure, 152/118; diagnosis, Pyelonephr. and Anemia; 3 weeks ?; died 5 months.
Mrs. E.—Age, 29; blood pressure, 218/134; diagnosis, Chr. Nephr. and Acute Nephr.; previous duration, 1 year ?; died few months.
Mrs. L.—Age, 30; blood pressure, 245/155; diagnosis, Art. Scler. and Chr. Nephr.; previous duration, 1 year+; died 1 year.
P.—Age, 32; blood pressure, 200/150; diagnosis, Art. Scler.; previous duration, 4 years+; died 1½ years.
H.—Age, 32; blood pressure, 206/140; diagnosis, Hypertension and Sl. Art. Scler.; previous duration, 5 years+; died 3 years.
G.—Age, 35; blood pressure, 164/108; Sl. Art. Scler. and Oral Sepsis; living 6¼ years; "well" 153/100.
Dr. S.—Age, 38; blood pressure, 184/112; diagnosis, Art. Scler., Obesity and Psychasthenia; previous duration, 2 years+; living 4¾ years; "well."
M.—Age, 39; blood pressure, 234/158; diagnosis, Art. Scler. and Psychon.; died 1 year.

At the other extreme of the age limit one would naturally expect that many of these older people would die after a short time, for most of them have passed the average span of life. Yet at the higher ages there seems to be a type of moderate hypertension which limits the duration of life very little, if at all. This is shown in the series of patients who were 65 years of age or more at the time of examination (Chart VIII). It is also shown even more strikingly in the group of patients between 60 and 64 years of age (Chart IX).

CHART VIII.

PROGNOSIS (AGE)

65 Years or More at Time of Examination

K.—Age, 76; blood pressure, 190/120; diagnosis, Art. Scl.; previous duration, 3 years+; died 1 month, infection.
G.—Age, 74; blood pressure, 206/118; diagnosis, Art. Scl.; died 3½ years, severe anemia.
W.—Age, 69; blood pressure, 180/90; diagnosis, Art. Scl.; previous duration, 3 years+; died, apoplexy, 3 years.
Mrs. Mc.—Age, 69; blood pressure, 185/100; diagnosis, Art. Scl. and Sl. Graves S.; died, apoplexy, 2 months.
Mrs. S.—Age, 68; blood pressure, 210/130; diagnosis, Art. Scl.; died.
S.—Age, 68; blood pressure, 186/90; diagnosis, Art. Scl.; died 6 years.
Mrs. N.—Age, 65; blood pressure, 170/90; diagnosis, Art. Scl. and Myoc. Insuff.; previous duration, 3 years+; died 1¼ years, heart.
F.—Age, 66; blood pressure, 194/96; diagnosis, Art. Scl. and Sl. Pain; living 6¼ years; well 160/70.
Mrs. T.—Age, 66; blood pressure, 162/95; Infec. Arth. and Sl. Art. Scl.; living 6¾ years; 172/98.
R.—Age, 68; blood pressure, 180/100; diagnosis, Sm. Vas. Lesion, Cerebrum and Sl. Art. Scler.; living 6 years; well 166/84.
Mrs. L.—Age, 69; blood pressure, 215/100; diagnosis, Art. Scl. and Psychoneurosis; living 5¼ years; 140-220.

CHART IX.

PROGNOSIS (AGE)

60-64 Years at Time of Examination

Mrs. P.—Age, 63; blood pressure, 212/180; diagnosis, Art. Scl., Nephritis and Diabetes; previous duration, 11-20 years; died few hours.
V.—Age, 62; blood pressure, 225/138; diagnosis, Art. Scl. and Myoc. Insuff.; died 4 months.
Mrs. T.—Age, 60; blood pressure, 163/95; diagnosis, Art. Scl., Chr. Nephr. and Anemia; died 11 days (sudden).

S.—Age, 62; blood pressure, 175/92; diagnosis, Art. Scl. and Sl. "stroke;" previous duration, 1 year+; died 6 years (apoplexy).
Mrs. H.—Age, 60; blood pressure, 210/98; diagnosis, Art. Scl. and Sl. Myoc. In.; previous duration, 4 years+; died 3 years (sudden).
H.—Age, 60; blood pressure, 195/120; diagnosis, Obstr. Jaundice and Art. Scl.; died 1 month (cancer?).
McC.—Age, 61.; blood pressure, 238/140; diagnosis, Art. Scl. and Obesity; previous duration, 4 years+; living 5 years (stroke 1 year ago).
Mrs. D.—Age, 64; blood pressure, 190/80; diagnosis, Art. Scl.; living 5 years; 165.
Mrs. S.—Age, 60; blood pressure, 215/120; Diabetes, and Art. Scl. (Ret. Hem.); living 5¾ years; 180/110 (Myoc.).
Miss C.—Age, 63; blood pressure, 188/104; diagnosis, Sl. Art. Scl.; previous duration, 2 years+; living 6½ years; 160; well.
Mrs. C.—Age, 62; blood pressure, 220/120; diagnosis, Art. Scl. and Parox. Aur. F.; previous duration, 5 years+; living 6 years; "fine condition."
Dr. N.—Age, 64; blood pressure, 210/110; diagnosis, Art. Scl.; previous duration, 9 years+; living 4½ years; 180/106.

Attention might be called to the case of Mrs. C., a woman 62 years of age, with a blood pressure of 220 systolic and 120 diastolic, whose hypertension had existed already for five years certainly. In addition to arteriosclerotic processes there were present also occasional paroxysms of auricular fibrillation. That patient is living after six years more and is reported to be in fine condition in every respect. During the past summer she is said to have enjoyed hiking in the mountains. This at the age of 68 years!

Another of these patients illustrates the resisting powers of some patients with arterial hypertension. Dr. N., aged 64, had a blood pressure of 210/110, with arteriosclerosis and several unfavorable prognostic signs. Nine years before, he had suffered in an automobile accident, a fracture of the skull, and while in the hospital the blood pressure was found to be over 200. Several years after we saw him, while performing a surgical operation, his finger became infected. This resulted in a marked sepsis with pyemia and the loss, by reason of a purulent infection, of the use of the right wrist and the left knee. He writes that he was practically unconscious during this illness for about two months. He made an excellent recovery, however, and now, 13½ years after the discovery of the hypertension, he is in fair general health with a blood pressure of 180/106.

Probably the most favorable cases of all, and partly from the standpoint of age, are those occurring in women at the time of the menopause. There were six of these cases.

One of them, an unmarried woman of 50 years of age, blood pressure 172/112, presented signs of myocarditis and a definite psychosis. She died after about six months of heart failure. The other five are living and most of them very much improved. Two of these presented very serious prognostic signs at the time of the examination. One of them with a blood pressure of 230/126 had rather marked retinal hemorrhages. She is living after five years and is in very good general condition. The detachment of the retina in her one good eye has left her with markedly impaired vision. The blood pressure is still elevated. Another patient, Mrs. C., aged 50, had a blood pressure of 225/115 and had suffered a slight stroke of paralysis. She is living after seven years, in excellent health, with a blood pressure of 145/85.

A chart of 15 favorable cases is presented (Chart X). Some of these are the menopause cases already mentioned. Others showed at the time of examination only a moderate degree of hypertension. They are considered quite favorable either because of a lack of progression of the hypertension or because of a marked improvement from the standpoint of the blood pressure.

CHART X.

FAVORABLE CASES

G.—Age, 35; Sl. Art. Scl. and Sl. Oral Sepsis; blood pressure, 164/108; living 6¼ years, well, 153/100.
F.—Age, 66; blood pressure, 194/96; living 6¼ years; occasional slight pain, 160/70.
Mrs. G.—Age, 49; Art. Scl., Old Goitre and Menopause; blood pressure, 178/102; living 7½ years; nervous, 150/80.
E.—Age, 40; Psychon.; blood pressure, 160/90; living, 6½ years; nervous, 160/90.
P.—Age, 45; blood pressure, 184/110; living 4½ years; much improved, 160.
Mrs. S.—Age, 47; Exoph. G.; blood pressure, 170/105; living 5½ years; 2 operations, 130/70.
R.—Age, 68; blood pressure, 180/100; living 6 years; "O. K. for 74," 166/84.
Mrs. R.—Age, 49; blood pressure, 174/98; living 6 years; much improved, 160/80.
Mrs. C.—Age, 50; Sl. stroke Menopause; blood pressure, 225/115; living 7 years; "in good condition," 145/85.
Miss C.—Age, 63; blood pressure, 188/104; living 6½ years; "fair condition," 160.
C.—Age, 44; blood pressure, 170/100; living 6¼ years; "well," "thinks blood pressure O. K."
E.—Age, 46; blood pressure, 160/94; living 6½ years; well, active, 128/80.
R.—Age, 40; blood pressure, 178/106; living 5 years; hemianopsia, 135?
Mrs. C.—Age, 62; Paroxysm. and Aur. Fibr.; blood pressure, 220/120; living 6 years; "fine condition in every respect."
S.—Age, 57; blood pressure, 172/100; living 4 1-3 years; "practically normal in every way," 155/95.

SUMMARY

In summary it may be said that with the onset of arterial hypertension the patient's period of health and well-being is not necessarily ended. A series of 15 favorable cases is presented in which there was either a complete lack of progression of the hypertension or else marked improvement in the blood pressure after periods of from five to seven years.

The condition of the arteries is the most important prognostic sign.

Patients with no sign of arterial change may be expected to do well. Those with normal urine and those with normal aortas in general show a rather favorable prognosis.

Patients with marked retinal changes, with any sign of myocardial insufficiency, with precordial pain, with renal insufficiency, may be expected to live only a very few years.

From the standpoint of age the presence of a hypertension in the very young is of rather graver significance than in the very old.

The onset of hypertension during the menopause in women presents the most favorable prognosis of all.

DISCUSSION (Abstract)

Papers of Dr. Gibbes and Dr. Sprunt

Dr. Elsworth S. Smith, St. Louis, Mo.—There are still some prominent clinicians who today maintain that arterial hypertension must be considered compensatory, and therefore also conservative, in that such a condition of high blood pressure is necessary to maintain the circulation against a greatly increased peripheral resistance. In a paper shortly to be published we hope to be able to show through a careful clinical study of large groups of cases that such a position is only partially tenable. For we trust to be able to demonstrate that high blood pressure is only compensatory in that class of cases, in which the arterial tree has lost its power of vasodilation either through the impossibility of removal of the causal vaso-constricting influences or else through fixation of the arterial tree at a narrowed calibre in the sclerotic process, resulting from the strain of a too long continued though at first controllable arterial hypertension.

On the other hand, in the reducible compensated group we will be able to show marked reduction in both the systolic and diastolic pressure without the slightest disturbance in either the cardiac or renal compensation. In the decompensated reducible group a similar marked fall in both the systolic and diastolic blood pressure will be shown without the slightest increase in the cardiac and renal decompensation, but on the contrary a marked improvement in decompensation and in many cases a complete restoration of compensation for shorter or longer periods of time.

We conclude, therefore, first, that arterial hypertension is only compensatory in the irreducible compensated and decompensated groups, because either no effort has been made at blood pressure reduction and fixation of arterial tree has thereby resulted or else because of the irremovability of the pressor or constricting influences.

Secondly, if cases are discovered at a sufficiently early period, the arterial hypertension can be reduced through removal of pressor influence and through vasodilation without the slightest disturbance of cardiac and renal compensation and with no increase of cardiac or renal decompensation, but an actual improvement in these states and in many cases a restoration of compensation. While at the same time a marked conservation of the cardiovascular renal apparatus will be thereby established, and many cases of irreducible arterial hypertension with all its disasters averted.

Thirdly, management of arterial hypertension should, therefore, be almost entirely prophylactic in its detection at the earliest possible time so as to prevent all those disastrous results accompanying irreducible hypertension. For at this time intelligent efforts at removal of causes of arterial hypertension will be rewarded with definite fall in blood pressure through vasodilation without the slightest disturbance in the circulation, while if the arterial tree be found fixed through arterial sclerosis or through irremovability of vasoconstrictor influences, then no harm will have been done, because under these conditions no fall in blood pressure could ever be obtained. We feel finally that, while arterial hypertension may be considered compensatory in the group where its reduction is impossible, it must never be considered conservative but always ultimately injurious and finally destructive to the cardiovascular renal apparatus.

Dr. Gibbes (closing).—I hold no brief for focal infections in their relation to hypertension. However, the statistics of my hundred cases would certainly indicate a possible connection between them. To find the incidence of focal infection in approximately 96 per cent of the cases, and to note the improvement which has been associated with their removal must certainly give us pause. Dr. Fontaine says that many cases of severe hypertension have had their teeth and tonsils removed and points to this as evidence against the responsibility of such infections for the high blood pressure. It seems to me that this is not sound reasoning. Certainly, in the case of the teeth, the fact of their removal might be accepted as indicating the existence in the past of a severe oral sepsis.

I think it most important that we do not leave this meeting with the idea that relief for hypertension is not obtainable. It has been suggested in the discussion that this is the case. Much can be done for many of these patients. The treatment may be summed up in the one word "rest," a full explanation of which I have not time to give. Certainly one of the most important phases of treatment is the feeling of optimism on the part of the physician.

Dr. Hamman speaks of the "usefulness" of high blood pressure. This certainly represents the consensus of opinion that is prevalently held. However, I am inclined to believe that the trend today is away from this idea. In the late stages of hypertension, when we see the condition associated with pronounced arterial thickening, we might well think of the increased blood pressure as a compensatory phenomenon. The importance of this distinction is in the question of treatment. We do not wish to meddle with useful adjustments, but we do not wish to leave a dangerous hypertension if it is not producing a good which outweighs the harm that might come from it.

As regards the incidence of syphilis in this series, I feel that the findings are fairly well in keeping with those of other observers. While we might all admit that a positive Wassermann reaction is nothing more than one of the symptoms of syphilis, if we wish to express it so, we must also admit that it is the most important single symptom. Certainly the Wassermann reaction is the safest guide in deciding for or against the existence of this disease, in its latent stages, that is afforded us by modern medical science.

TREATMENT OF SOME MINOR DISEASES IN EARLY INFANCY: COLIC, HABITUAL REGURGITATION AND SLEEPLESSNESS*†

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Three of the commonest and least understood of the minor ailments of early infancy are colic, the habitual regurgitation or "spitting up" of food, and sleeplessness. Although insignificant in

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themselves, they are the cause of much distress and anxiety to the mother, and form a triad which has blasted many a pediatric reputation. Their discussion in one paper requires considerable temerity on the part of the writer, and is possible only because of his firm conviction that the vast majority of infants suffering from one or the other of the conditions mentioned can be quickly and permanently relieved by the simple measures to be described.

Colic.—Colic is usually described as a paroxysmal pain in the abdomen occurring as the result of the spasmodic contraction of the muscular wall of the intestine or stomach. Less frequently it is due to the distention of these organs. It is often spoken of as a mild form of intestinal indigestion, and is usually accompanied by eructations of gas or swallowed air, the expulsion of flatus, or passage of green, curdled, slimy stools. (It must, of course, be understood that the colicky pains of appendicitis, intussusception, peritonitis, etc., are not included in the present discussion.) During the paroxysm, the child emits a series of loud, sharp cries, the legs are drawn up on the abdomen, the hands and feet are often cold and clammy, and there is every evidence that the child is experiencing severe pain. Yet, in the intervals between attacks, the child looks surprisingly well, and indeed the day after a severe spell he is apt to be the only one in the household who shows no visible evidence of the harrowing experience of the previous night.

Colic is especially frequent in the first few months of infancy, oftener in breast-fed than in artificially fed infants, and occurs most commonly in the late afternoon or night. Although one's first impression of the colicky infant may be that the attacks have not interfered with his thriving, closer inspection of the weight curve will often reveal the fact that the weekly gains, although regular, have been small. This failure to make satisfactory gains in weight is then ascribed to lack of sleep or the increased metabolism produced by crying, and the real cause is overlooked.

Among the occasional but relatively infrequent causes of colic in the very young infant may be mentioned overfeeding, too frequent feedings, an unsuitable food, especially one with too high a carbohydrate or fat content, chilling of the body surface, constipation, etc. Occasionally the colic seems to be precipitated by the taking of some food to which the infant organism is directly sensitized, the attack being in the nature of a specific allergic reaction. Or again, the crying may be part of the general restlessness and fretfulness of the hypertonic infant with an unstable autonomic nervous system, the discussion of which belongs more properly to the second and third parts of this paper.

All of the etiologic factors enumerated, however, will, if added together, explain only about 10 to 15 per cent of the cases. In fully 85 to 90 per cent, the attacks of so-called colic, symptomatically indistinguishable from true colic, are explicable on an entirely different basis, and that is simply hunger. Let us see on what evidence this statement is based. When the supply of breast milk is not quite sufficient for the infant's needs, the amounts obtained from the breast will usually be largest in the morning after the mother has had a good night's rest, and least abundant in the late afternoon and evening when the mother has become tired out by the day's activities. Weighing the infant before and after each nursing will then reveal a surprising variation in the amounts obtained at the different nursing periods and explain the greater frequency of colic in the afternoon and evening. Moreover, nursing a dry or partially dry breast results in the infant's swallowing a large amount of air, thereby accounting for the gastric eructations and expulsion of flatus. Such underfeeding is much more commonly overlooked in the first few weeks of life than later in infancy. In the event that the role of hunger as an etiologic factor appears doubtful, one may resort to the "therapeutic test." If the colic is due to an intestinal indigestion, giving more food should make it worse, whereas, if insufficient food is the cause, prompt relief will accompany the giving of supplemental (or complemental) feedings. Often it will be found sufficient to give one or two ounces of a suitable formula in addition to the breast at the afternoon or evening feedings alone, but in other instances complemental feedings each time will be required to insure the optimum gain in weight and cessation of the colic.

In the smaller group of cases not due to underfeeding, the treatment will depend upon the cause—increasing the interval between feedings, lessening the amount of food for the overfed infant, changing the formula, etc. If the stools are acid, due to excessive carbohydrate fermentation, increasing the protein content of the formula by adding one or two ounces of dried milk, such as dryco or klim, or adding one of the calcium caseinate compounds, such as casec, will often be found effective. The child should be held upright for a time after feedings to

facilitate dislodging the swallowed air by belching. Finally, for the attack itself, the administration of carminatives, the application of warmth to the abdomen by laying the child across a hot water bottle, and the giving of a large enema will almost always afford at least temporary relief. The fretfulness of the hypertonic infant and relief of the condition will be referred to later under the discussion of sleeplessness.

Habitual Regurgitation of Food.—One of the most annoying, frequent and aggravating habits of infancy is the spitting up of one or two mouthfuls of food after feeding. Some infants will spit up after each feeding, others only occasionally. Sometimes the regurgitation occurs immediately after the taking of food, at other times only after the food has been in the stomach for one-half to two hours. Invariably, however, the act is accomplished without the slightest sign of inconvenience or distress on the part of the infant. The immediate regurgitation of small amounts of the feeding may be due merely to the rejection of the excess food from an overfilled stomach, in which instance there is usually a history of the infant's having made large weekly gains in weight. Reference in this paper is not made to this type of child, but rather to those who have made small or insufficient gains in weight, due to the fact that, although their caloric requirements are amply covered, sufficient food is lost through regurgitation to prevent the optimum gain in weight. Moreover, not infrequently there is a history of the occasional and often forceful vomiting of large amounts of food, the description being suggestive of the type of vomiting seen in true pyloric stenosis. Indeed, careful observation will reveal the fact that in most cases of pyloric stenosis prior to the onset of the typical projectile vomiting there has been frequent regurgitation almost from birth. This statement, however, must not be taken to mean that true pyloric stenosis is the usual sequel of the habitual regurgitation referred to, for the reverse is true. The vast majority of such infants are not sick and never develop more serious symptoms. Roentgen examinations in the few cases in which we have employed them, have shown little or no delay in the emptying time of the stomach. Nevertheless, repeated careful observation will usually show visible gastric peristalsis even in the mildest cases, the peristaltic waves being well developed in some instances and poorly defined in others. Because of the fact that some degree of visible gastric peristalsis was present in practically all our cases of regurgitation, it seemed rational to employ therapeutically the non-surgical measures usually found efficacious in the milder types of pyloric stenosis. Indeed, whether or not habitual regurgitation be considered the mildest type of pylorospasm, atropin, administered in sufficient doses to produce its physiologic effect, is almost a specific for the condition. As atropin deteriorates rather rapidly when in solution, it must be freshly prepared at least every two or three weeks in order to retain its full effectiveness. The drug is given in the dosage of one drop of a 1/960 solution (½ grain to one ounce of water) of atropin sulphate 20 minutes before each feeding, the dose being increased until the symptoms disappear, or flushing of the skin and dilated pupils indicate the full atropin effect. Often the spitting up ceases almost from the first dose. In the exceptional cases in which atropin despite full dosage is without effect, a modification of the thick cereal feeding used in pyloric stenosis is frequently successful. One part of farina or cream of wheat is cooked with seven parts of milk until very thick, and approximately one tablespoonful of the thick cereal fed immediately before each breast or bottle feeding. The amount of thick cereal necessary to cause cessation of the spitting up varies in different cases, and, contrary to expectations, the dilution of the thick cereal in the stomach by the milk does not nullify its good effects. There is some evidence that the beneficial action of thick cereal in the vomiting of infants may be explained by the stimulating effect on the peristaltic function, that is, the tonic contraction of the stomach walls about the bolus of food, which is induced by the taking of solid food.[1] [2] [3] In obstinate cases, however, the entire feeding should consist of thick cereal, care being taken to prevent dehydration of the infant's body tissues by administering one to two ounces of water an hour before feeding or at night. By some such regimen as has been indicated, it is not only possible to control spitting up, but the retention of the entire feeding will result in the desired gain in weight.

Sleeplessness, Restlessness.—The quiet, peaceful sleep of the healthy young infant is proverbial among all races and all peoples. Occasionally, however, one finds the rare exception, the apparently healthy young babe without manifest evidence of illness or abnormality, normal except for the fact that he is fretful, or restless, and instead of sleeping 18 to 22 hours out of the 24, he sleeps perhaps 6 to 10. There are many possible causes of this disturbed

sleep. To mention a few, the bedroom may be stuffy, or the child too hot or too cold, he may have indigestion or be hungry or wet, he may have colic, or otitis media, or be teething, or his breathing be obstructed by adenoids or tonsils. A prolific source of trouble in this respect is the development of faulty sleep habits when the mother or nurse rocks or pats the baby to sleep. Another frequent cause is the irritation of the skin from an ammoniacal diaper. But when all such more or less obvious causes have been eliminated, there still remains an appreciable percentage of infants who are fretful and unhappy and never enjoy normal, peaceful sleep. Such children usually have cold, clammy, bluish hands and feet, and are apt to have slight pallor or blueness about the mouth. Constipation may be present, but often there is a tendency to diarrhea, 8 or 10 thin but well digested stools being passed in the day. Moreover, in many instances there is a history of an associated pyloric stenosis or habitual regurgitation of food, and in most cases, though not necessarily in all, close observation will reveal visible gastric or intestinal peristalsis (gastro-enterospasm).

For the type of case just described, atropin is again almost a specific. Its effects in a typical case are striking in the extreme. The restless, crying, fretful infant after one or two doses of atropin will sleep so profoundly that for a time he cannot be aroused for feedings. Indeed it frequently happens that the mother will telephone before the end of the first 24 hours on the atropin treatment and say that she has stopped the drug because "it put the baby to sleep so soundly that he cannot be aroused," and she fears that the medicine is too strong. Similar experiences are not infrequent in the treatment of pyloric stenosis with atropin. The period of unusually deep sleep, however, is only a transient one, and after a day or two on atropin the slumber is a perfectly natural, healthy one. The drug is given at first with each feeding, but after two or three weeks this may often be reduced to three or four times daily. In most instances the atropin administration with occasional interruptions of one or two days must be continued for at least several months, and, rarely, during the greater part of the first year of life. Any attempt at discontinuing the treatment after a shorter interval usually results in a prompt return of all the symptoms within 24 to 48 hours of the withdrawal of the atropin, and this fact is made use of in determining the length of time the treatment should be continued.

Comment.—For many years there have been occasional references in the German pediatric and neurologic literature to so-called hypertonic conditions of the musculature in children. It is unnecessary to enter here into a further discussion of the varied symptomatology included under this head except to say that many of the most striking features will be found described by Eppinger and Hess[4] in the conception advanced by them of the functions and disturbances of the vegetative nervous system. Using the work of Eppinger and Hess as a basis for discussion, S. V. Haas,[5 6] of New York, has called attention to the relationship of pyloric stenosis to other symptoms frequently found in the so-called hypertonic infant. As typical of the latter condition, Haas mentions, in addition to projectile vomiting and visible peristalsis, pallor, lividity, loss of turgor, circumoral cyanosis, cold, clammy, cyanotic hands and feet, subnormal temperature, spasm of the larynx, pharynx, cardia, and various portions of the intestines as well as hypertonicity of the skeletal musculature. It will be seen that the symptoms enumerated as characteristic of the hypertonic infant include many of those mentioned in our discussion of sleeplessness and habitual regurgitation, as well as certain forms of restlessness associated with colic. The beneficial effect of atropin is probably explained through its action in correcting the autonomic imbalance.[7]

SUMMARY

(1) Most cases of so-called colic in the young infant are due to hunger and can be eliminated by giving a sufficient amount of food.

(2) Habitual regurgitation of food is closely related to pyloric stenosis or pylorospasm and may be stopped by giving atropin in sufficient dosage, or by the administration of thick cereal feedings.

(3) Certain forms of restlessness and sleeplessness yield quickly to atropin therapy.

(4) Habitual regurgitation in certain types of restlessness and colic are probably due to overaction of the autonomic nervous system or autonomic imbalance.

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DISCUSSION (Abstract)

Dr. L. R. DeBuys, New Orleans, La.—This practical paper of Dr. Hempelmann is of decided interest to the pediatricians, as it includes the consideration of three important symptoms—namely, colic, habitual vomiting, sleeplessness and restlessness. Attention to detail is essential in the successful practice of the art of medicine. I would like to endorse and emphasize what Dr. Hempelmann says in his paper and wish only to make some few remarks about the individual symptoms. I was glad to hear Dr. Hempelmann make a division between colic and pseudo-colic. In the breast-fed infant we have found a food supply to vary frequently. We have found the breasts to give different quantities at different times of the day as, for example, morning and afternoon. We have found also that the two breasts will vary in their secretion at a given time, the greatest variations in an individual case being a difference of five ounces between the two sides at one of the morning feedings, observations being made on two different days, and only one breast being nursed at that particular feeding. Exhaustion of the mother towards the late afternoons may be a contributing factor in the diminished secretion of milk at that time. Another point I wish to call your attention to is the futility in forcing the mother to stuff herself so as to increase her milk supply. It will be well to bear in mind the fact that when the mother is given an excess of food desiring to put on weight the food given is not serving the purpose intended, and it will be found that the milk supply is usually diminished rather than increased. This frequently results in causing an indigestion in the mother.

With regard to habitual vomiting, thumb sucking with its consequent swallowing of air increases the amount of air in the stomach with the result that there is less place for food, and this is one of the contributing factors in the habitual vomiting. Sometimes a baby will vomit from habit. In these cases the habit may be overcome at times by tube feeding the infant.

With regard to sleeplessness and restlessness, the parents are often to blame, and especially when they cause excitement and overstimulation of the infant, particularly within an hour or two before bedtime.

Dr. John Zahorsky, St. Louis, Mo.—I agree with all the statements made in this paper, but I wish to lay more emphasis upon one phase of the subject to which the essayest referred—namely, those cases of digestive disturbances in infants showing a diarrheal tendency. My own studies of the stools in these cases show that they fall into two groups—the infectious diarrhea and the allergic enteritis. The difference is often clearly shown by the cell content of the stool. The first form shows macrophages and polymorphonuclear cells in the stools; the second is characterized by an exudate of mononuclear cells and eosinophils.

ETIOLOGY AND PATHOLOGY OF PERI-ARTERITIS NODOSA*†

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This disease was first clearly described by Kussmaul and Maier[1] in 1865, although Rokitansky[2] had noted in 1853 peculiar nodules upon the coronary and mesenteric arteries in a case dying rather suddenly with symptoms of dysentery. The tissues of this case studied by Eppinger[3] thirty-five years later demonstrated lesions now recognized as those of peri-arteritis nodosa. Since then approximately sixty cases have been reported. The literature on this subject has been reviewed up to 1907, by Dickson,[4] by Klotz up to 1917 and in our publications (Harris and Friedrichs[5 6]) up to 1922. Since that date only two cases have come to our attention.

Although there are some who do not regard peri-arteritis nodosa as a specific disease, the bulk of the opinion is that it is a truly distinctive vascular entity which is due to some specific causative factor. Those observers who do not regard it as a separate disease, believe that it is simply an arteritis produced by whatever particular micro-organism or toxin may be present as a systemic invader. For example, if there exists a streptococcal septicemia, it is their opinion, that the streptococcus may produce an arterial pathology identical with the lesions of peri-arteritis nodosa. When it is realized how frequently the human system is invaded by the causative agents of the various acute infectious diseases, and on the other hand how rarely the lesions characteristic of peri-arteritis nodosa have been noted, it seems rather unlikely that such vascular changes should be so seldom produced through this means.

Peri-arteritis nodosa is a disease characterized by a primary exudative lesion of the peri-adventitial structures, adventitia, media and occasionally the intima of the smaller sized arteries. Necrosis, demonstrating a rather characteristic oxyphilic staining character, occurs especially in the media which often leads to both true and false aneurysmal formation and marked thrombosis. The arteries most frequently involved are the coronaries, the branches of

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the renals, the smaller branches of the vessels of the celiac axis, the mesenteric and the branches of the arteries of the extremities and subcutaneous tissues.

CLINICAL ASPECT

Since the area of greatest injury may be in the arteries of any of the various visceral cavities such as the cranial, the thoracic, including the pericardial and pleural and the abdominal, the symptomatology presented may be referable to almost any system of the human body. In this connection, it may be of interest to note the wide range of diagnoses that have been made for certain of the reported cases, for example: dysentery, trichinosis, hemorrhagic nephritis, morbus maculosa (Werlhoffii), marasmus, encephalitis, hemiplegia, typhoid, miliary tuberculosis, rheumatism, polymyositis, polyneuritis, cardiac insufficiency, septicemia, surgical abdomen and various others. Only two rather constant clinical features seem to exist, namely, a moderate irregular fever and a leucocytosis of varying degrees. It is because of this great discrepancy of symptomatology that the diagnosis in the living case is only rarely recognized. The exceptional instances wherein a diagnosis was made during life, have occurred where the lesions were present in the smaller peripheral vessels. In such cases local nodules were formed which occasioned operative intervention, and examination of the tissue revealed the diagnosis. A case is also reported by Baehr[7] wherein through an exploratory laparotomy, the diagnosis was made.

ETIOLOGY

Syphilis has always been discussed as a possible factor in the production of peri-arteritis nodosa. Most observers, however, have concluded from their histopathological studies that the lesions present do not conform in any manner with changes produced in the vessels by syphilis. Special stains for the Treponema pallida when applied have failed to show the presence of this spirochete. It seems likely that since this micro-organism is such a frequent invader of the arterial system, it would certainly produce more often the lesions recognized as those of peri-arteritis nodosa. Thus, the rare occurrence of peri-arteritis nodosa as compared to vascular syphilis, the failure to demonstrate the presence of Treponema pallida in the lesions, the negative Wassermann reaction which is so frequently positive in vascular syphilis, and the differential histopathology of the lesions are sufficient to eliminate syphilis as a causative factor.

Among the reported cases of peri-arteritis nodosa but few of an already small number have been investigated from a causative standpoint. It is likely that more etiological investigation has not been undertaken because of the fact that the diagnosis of the disease is frequently made only when its nature is revealed through study of the microscopic sections. In this way, the case is not only long since dead but the tissues have been fixed in solutions that destroy all possibility of the employment of cultural and transmission methods.

Klotz[8] records the recovery of streptococci from the post-mortem material of two cases and enumerates five other instances in which some form of this micro-organism was found under similar conditions, namely, Datnowiski 1, Jonas 1, Beattie and Douglas 1, and Lamb 2. These workers also obtained other organisms such as bacillus coli, influenzae, staphylococcus aureus, diphtheroids and bacillus proteus vulgaris in their cultures. Babes and Mironescu[9] observed diplococci and streptococci in sections of certain peri-arteritis nodosa lesions. They report, at the same time, however, that they observed diplococci in sections of an aneurysm of the aorta. Loncope[10] found streptococci in specially stained sections, but these cocci were located away from the lesions of the vessel. He also obtained cultures which were lost.

In none of these instances was successful experimental animal transmission reported. In addition to this fact the association of other micro-organisms representing definite terminal and post-mortem invasion vitiates the significance of the presence of streptococci which may also play the role, at times, of a terminal invader. In this connection, it may be stated that because of the character of fever and leucocytosis usually present in the clinical case, many blood cultures have been reported, all of which have proven negative. It would seem that if the arteritis present in this disease were due to the streptococcus, its growth would have occurred in some of the blood cultures performed. Again, as in the instance of syphilis, it is likely that because of the frequency of streptococcal septicemia, peri-arteritis nodosa would occur more often if this organism could produce the lesions.

Lamb[11] observed two cases of this disease in which he reports that four blood cultures made during life were negative. The post-mortem

cultures yielded the following results: In *Case 1*, heart's blood showed Bacillus coli and Gram-positive cocci. Exudate from the peritoneum and mesenteric lymph nodes showed a streptococcus. Negative cultures were obtained from the pericardial fluid. In *Case 2*, the cultures from the heart's blood were negative. The pericardial fluid showed Bacillus coli, whereas cultures from the peritoneal cavity showed Staphylococcus aureus. Lamb inoculated an emulsion of the arterial nodule into two guinea pigs and three rabbits without producing an apparent disease. The animals were killed after two and one-half months of observation and the tissues were examined grossly and microscopically, but no lesions were found. A streptococcus culture obtained by him from a portion of an arterial nodule was injected into a guinea pig, a rabbit and a monkey with negative results.

In the cases reported by Klotz[8] the following results are recorded: cultures of the blood, both ante-mortem and post-mortem, in one case were negative. In the same case Streptococcus mitis and Bacillus proteus vulgaris were obtained from the bile. In the second case the intra-vitam blood culture was negative but the post-mortem cultures of the heart's blood showed Streptococcus anginosus and salivarius. Cultures from a subcutaneous nodule revealed Staphylococcus aureus and a diphtheroid. Cultures from other sources revealed mixed varieties of micro-organisms. Klotz injected these three strains of streptococci directly into the peri-arterial tissues of the celiac axis and into the anterior mediastinum of a series of rabbits. Some of these animals were killed by the injections. In some, local lesions were produced at the site of inoculation, while in still others certain lesions were found in areas remote from the area of inoculation. Klotz does not believe that any reproduction of the disease was induced through these inoculations.

The presence of many of the micro-organisms that have been obtained in the cultures from the lesions can be demonstrated in nearly any dead body. Diphtheroids, for example, have been shown by various workers, including Harris and Wade[12] as occurring ubiquitously.

Haun[13] worked with the living case diagnosed as peri-arteritis nodosa through examination of a removed subcutaneous nodule. He injected two guinea pigs intraperitoneally with blood removed from the vein of the human case. These animals died in eight weeks and microscopic lesions which he considered consistent with those of peri-arteritis, were found. The blood withdrawn from the heart of the injected animals and an organ emulsion were employed for subsequent injections. In both instances he found in the animals of the second generation microscopic arterial lesions. No gross lesions suggestive of peri-arteritis nodosa were noted in any of the experimental animals. The blood was not filtered to ascertain if the causative agent was filterable.

In the transmission experiments[6] carried out by Friedrichs and myself, we employed an emulsion procured from the kidney nodule of a typical human case. The kidneys were seared and the gross lesions were dissected out with sterile instruments. Fragments were cultured in plain, glycerol potato blood and dextrose agar and Loeffler's blood serum. After a week's incubation, no growth was demonstrated. The emulsion was prepared by grinding the nodules in a sterile mortar with the addition of saline. After sedimentation, the supernatant portion was inoculated into the marginal ear veins of two rabbits. One died two months later and presented gross lesions in the liver only. Microscopically, arterial lesions analogous to those of peri-arteritis nodosa were found in the lungs, liver and heart. The other rabbit was killed eighteen days later, after cultures had been primarily made from the heart's blood. These cultures were prepared aerobically and anerobically and by the Smith tissue culture method, but no growths were obtained. This rabbit showed hemorrhagic lesions in the liver. Microscopically, lesions like those of peri-arteritis were found in the lung and liver.

The best gross and microscopic lesions were obtained in a rabbit inoculated with a Berkfeldt filtrate (letter N) obtained from the liver, spleen and kidney emulsion of a rabbit which had been inoculated with a human nodule emulsion. This rabbit inoculated with filtrate died three months later. The lungs presented gross nodular lesions, and irregular hemorrhagic extravasations were found on the under surface of the liver. The sectioned surface of the liver showed dilated vessels containing thrombi. Microscopically, striking lesions were found in the lungs and liver while peri-arterial adventitial nodules were seen in the kidney and heart.

Thus, we obtained gross lesions in the liver and lung of most of the rabbits, the most typical of which occurred in a rabbit injected with filtrate. In all the rabbits microscopic changes of varying degree resembling those occurring in peri-arteritis of man were produced. They con-

sisted of infiltration into the adventitia, media and at times, the intima, of cells of the neutrophilic, eosinophilic, lymphoid and plasma types. In addition to the cellular infiltration, degeneration and necrosis of the media, dilatation of the vascular lumen and thrombosis were found in certain of the arteries.

Recently, 1924, Vasiliu and Iriminoiu[14] obtained a streptococcus upon different culture media from the thrombi of the mesenteric and splenic arterial lesions of a case dead of peri-arteritis nodosa. They inoculated mice and produced what they called a "non-fatal disease."

However, they did not find in these animals when sacrificed, any lesions resembling peri-arteritis nodosa. They filtered their cultures and inoculated two rabbits and a dog without producing any illness. They believe that the streptococcus plays an important role in the production of peri-arteritis, although they present no experimental proof or basis for this opinion. In this connection, it must be appreciated that their filtrate was procured from an emulsion of a culture of streptococcus grown upon agar. In this manner they are presuming that what is probably a highly specialized virus was growing on their agar slant culture, which, of course, is unlikely. In other words, their filtrate for inoculation was not prepared from the lesion of the human case, in which we consider the virus is present, but was obtained from a streptococcus slant culture grown originally from the human lesion. Their conclusion is that the causal agent could be a streptococcus, an unknown filterable virus or that the disease may be caused by other pathogenic germs.

These authors do not believe that the results of Haun are very convincing, although they state that our results (Harris and Friedrichs) show that we have been able "to produce in the rabbit with the infectious material filtrate, lesions altogether identical with the lesions of peri-arteritis nodosa of man."

PATHOLOGY

The name itself, peri-arteritis nodosa, would indicate an inflammation of the peri-arterial structures which occasions nodules or nodosities external and contiguous with the vessel. While from a microscopical standpoint such a picture is in some instances observed, the gross nodular aspect of the artery is produced by true and false aneurysmal protrusions and thrombosis of these, with or without accompanying organization. In other words the peculiar nodules seen at autopsy occur along the course of the vessels and not as bumps or knobs on the sides. These gross nodules are often out of all proportion to the size of the vessel from which they arise and the artery may be hardly visible within the mass formed. It is from these aneurysmal "blow outs" that hemorrhage of varying extents may present itself in the clinical case. As a matter of fact, so odd are the lesions found at autopsy that unless one has seen a previous postmortem, the diagnosis is not usually made until the tissues come through to the microscope. In order that the gross picture may be more readily diagnosed we have suggested that the name be augmented to "peri-arteritis nodosa aneurysma thrombotica." We believe that if such descriptive terms were added, the lesions presented at autopsy would be more in accord with such nomenclature and therefore more likely to be recognized as the disease peri-arteritis nodosa.

The microscopic pathology as described in the various reports is quite similar as a whole. As the component portions of the pathology incorporated in such a study are quite extensive, the descriptions are elaborate and comparative observations are found with difficulty. For this reason we have suggested a classification of the lesions presented into three groups, namely: (1) injury of the vessel wall; (2) results of the wall injury; (3) injury resulting to the tissues or organs. These groups represent in sequence the pathology as it occurs. When group 1 lesions have been set into action by the causative factor, their ravaging effects upon the arterial wall lead to the formation of lesions of group 2 and as group 2 lesions develop, they lead to the formation of lesions of group 3.

The lesions of group 1 consist of a cellular infiltration into the adventitial and peri-adventitial structures of the artery. This cellular infiltration is usually primarily of the polymorphonuclear variety and arranged focally or as a nodule, but occasionally they are found circumferentially arranged. There may be associated some serum and fibrin. These exudative elements may extend through the musculature causing separation and necrosis of the smooth muscle cells and may even penetrate through the intima and rupture the internal elastic lamina. Necrosis of the media usually takes place and may be focal, but often forms a complete ring within the wall. The necrotic material is granular and is distinctly oxyphilic in its tinctorial property assuming a bright red color when stained by the eosin-hematoxylin

method. This rather unique staining quality of the necrosed area has been described rather generally in the histopathological reports of this disease. Secondary proliferation of connective tissue of the subendothelial layer and also following in the wake of the exudative area at the periphery of the vessel may occur. We believe that the primary area of attack of the virus is usually in the adventitial and peri-adventitial structures, although we see no reason why other portions of the vessel may not at times be primarily injured.

The lesions classified as group 2, or the phenomena consequent to the vessel injury described for group 1 may be enumerated as follows: True and false aneurysms, hemorrhagic extravasations, thromboses and infarctions. These various factors, as can be appreciated, are pathological processes consequent to the injury present in the arterial wall. Proliferative and reparative processes including attempts at organization of the thrombi may be seen in this group. Embolism may occur herein or extensive hemorrhagic extravasations, either of which may cause sudden death. In our reported case,[6] extensive hemorrhage occurred about the kidney and ruptured through the peritoneal coat, large blood clots being found in the peritoneal cavity.

In group 3 are included the retrograde changes that result from the partial or complete curtailment of blood supply which in turn had been caused by the processes described in group 2. For example, aneurysm, thrombosis and hemorrhagic extravasation may lead to degeneration or necrosis of parenchymal structures with consequent functional derangement of the organ injured. Thus hemiplegia, nephritis, hematuria, myocarditis or other such phenomena may be grouped as lesions of this third group.

From a study of the pathology it can be seen that the concentration of such lesions in various structures or viscera of the body, such as the brain, heart, lungs, gastro-intestinal tract, or kidney is naturally accompanied by the symptomatology arising from their greatest focus of injury. It is for this reason that the clinical presentations must of necessity be of a protean character.

The rarity of the infection of peri-arteritis nodosa in man is inexplicable, but this is also the situation with many of our other rare diseases such as glanders, anthrax, Addison's disease and many others. In this connection it is of interest to note that Lupke[15] and Jaeger[16] have described in the stag a disease identical with peri-arteritis nodosa of man. Guldner[17] reports similar lesions in the pig and calf. It is therefore possible that a lower animal of some type forms the natural host of the organism of peri-arteritis nodosa.

CONCLUSIONS

We believe that the pathological classification into three groups of the lesions present in this disease will prove of service in the description of the pathology observed. These groups consist of (1) the injury of the vessel wall; (2) the result of the vessel wall injury; and (3) the injury resulting to the organs or tissues.

We are of the opinion that the augmentation of the name to peri-arteritis nodosa aneurysma thrombotica would serve as an aid in the gross pathological diagnosis of the disease.

Based upon our experimental results we regard peri-arteritis nodosa as a specific infectious disease which can be transmitted to the rabbit. These animals manifest a pathological picture corresponding to that of the human disease.

The excitant of the induced lesions can be passed through a Berkfeldt N filter and is to be included in the group of filter passers.

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BLASTOMYCOSIS*

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Blastomycosis is a parasitic infection due to blastomycetes and is cutaneous or systemic, or both. The skin is the site of infection in the majority of cases, although few anatomical structures are immune to its invasion. It is probably contracted from natural moulds in unhygienic surroundings. Not infrequently there is a history of a previous injury at the site of the lesion. The systemic infection is rarely secondary to cutaneous blastomycosis. On the other hand, a large per cent of systemic cases are prone to dermal implantation. The pulmonary and osseous systems are frequently involved in cases of systemic infection. Dermal manifestations are granulomatous formations honeycombed with miliary abscesses. The outstanding features of systemic blastomycosis are those of pyemia. It is impossible to differentiate pulmonary blastomycosis from a tuberculous process without laboratory aid.

Fig. 1, Case 1.
Cutaneous blastomycosis as it appeared December 12, 1921.

*Read in Section on Dermatology and Syphilology, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., November 9-12, 1925.

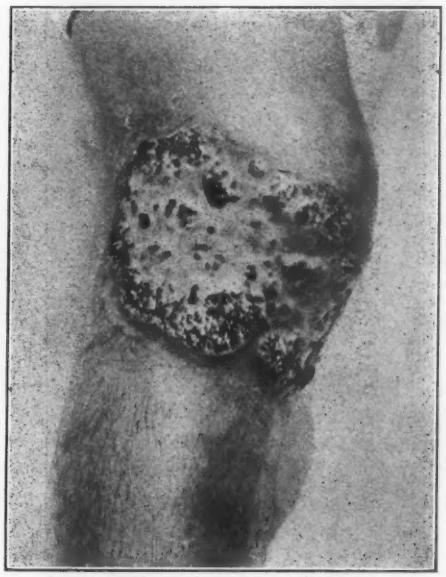

Fig. 2, Case 1.
Same as Fig. 1, different view.

It is estimated that more than one-third of the cases are systemic and that 90 per cent of these are fatal. This rate of mortality should be reduced. To obtain satisfactory results, it is necessary to recognize the condition early. Many cases are treated indefinitely with little or no effort to locate the etiologic factor. The results are none too favorable when the best means of eradication are used.

The following cases are not only typical, but also emphasize the value of early treatment and control of the patient:

Case 1.—July 27, 1920, R. T. M., a white man, age 37 years, a farmer, presented an extensive foul, discharging ulceration on the anterior surface of his right leg, just below the knee. It had appeared two years before as a small pustule. Not yielding to various local applications, it had gradually extended until it covered an area approximately 8x15 cm. The granulations had been curetted twice, but returned each time.

A granuloma studded with small abscesses led to a clinical diagnosis of blastomycosis. This interpretation was verified by finding yeast-like, double-contoured, budding organisms in the purulent discharge. An erythematous dose of filtered radiation was given and another curettement done. He was then placed on large doses of potassium iodid and instructions were given to return in six weeks. He returned December 12, 1921, 16 months later, with the lesion almost as large as on his former visit. He stated that it had practically disappeared at the end of six months, but that the growth had been unheeded for the preceding 10

Fig. 3, Case 1.
Showing unhealed lesion below knee, and new lesion on inner surface of leg, July, 1925.

months. Six weeks' hospital treatment with sodium iodid intravenously at daily intervals and filtered radiation every three weeks resulted in marked improvement at the time of dismissal from the hospital. He was advised to take potassium iodid by mouth and to return in six weeks.

In July, 1925, three and one-half years later, he made his third visit. The original lesion had not healed. It was a simple ulceration with no evidence of blastomycosis. However, there was a typical blastomycotic ulceration about 6x10 cm. on the inner surface of the middle of the right leg. It was irradiated thoroughly by filtered x-rays and destroyed by electrocoagulation. He refused hospital treatment and failed to return for further observation or to respond to inquiry concerning his present condition.

Case 2.—December 19, 1924, J. W., a white man, age 33 years, a farmer, presented an enormous discharging ulcer on both gluteal regions. The lesion was irregular in outline but approximately 7x30 cm. in dimension. It extended from the crest of the left ilium to a point midway between the crest of the right ilium and the tip of the coccyx, and downward to the anus, involving the lower portion of the rectum. The inguinal glands on both sides were enlarged and one of the glands on the left had ruptured. An attempt to find the exciting organism by aspiration did not materialize. The lesion had resulted from two warty projections occurring 16 months previously.

During the initial period he incised the pustules and was subsequently treated by several physicians. About five months after the onset the condition was diagnosed granuloma inguinale, because Donovan's bodies were thought to have been found. Radium therapy and tartar emetic caused a temporary regression. No doubt, the radium was the beneficial agent.

The lesion had the characteristic appearance of blastomycosis and the patient was admitted to the hospital for the purpose of substantiating the diagnosis and instituting treatment. Failing to find the causative organism from the surface discharge, sections of tissue were excised. Many yeast-like refractile cells were discovered in the deeper pockets of pus. Sectional examination disclosed several epidermal abscesses, giant cells and marked hyperplasia of epidermal tissue. Some of the giant cells harbored blastomycotic forms.

An uneventful recovery followed filtered radiation of the gluteal, anal, and inguinal regions, curettement of the granulation tissue, antiseptic dressings, and iodid therapy. The rectal involvement received an application of radium. Iodids in increasing doses were given both intravenously and orally. The maximum daily dosage was 225 grains of potassium iodid by mouth and 62 grains of sodium iodid intravenously. At the end of two and a half months he returned home, but was advised to continue the iodids by mouth. He was able to assume a sitting posture for the first time in 18 months. His physician reports that he has had no evidence of recurrence.

Fig. 4, Case 1.
Different view of Fig. 3.

Fig. 5, Case 2.
Cutaneous blastomycosis, December 19, 1924.

Case 3.—November 6, 1922, C. W. V., a white man, 31 years of age, a laborer, exhibited a small furunculous process on the dorsum of his right foot. It had appeared three months previously at the site of an injury which had healed. The purulent material contained double-capsuled bodies of the mycetic type. It has not recurred since the use of unfiltered radiation, curettement and internal administration of potassium iodid.

Case 4.—September 19, 1923, J. L. M., a white man, 72 years of age, a farmer, had a granuloma involving the bases of the second and third fingers of his right hand. The greater portion was on the interdigital surfaces, but extended to the palmar and dorsal sides of the fingers. Two years before he had an injury to his hand while hauling timber, and the lacerated fingers refused to heal. It had been considered malignant and an escharotic paste of some kind had been applied. This caused a temporary disappearance, but the lesion had recurred six weeks before. Microscopic examination revealed the etiologic factor and rapid recovery resulted from the use of unfiltered radiation, curettement and the oral administration of potassium iodid.

Case 5.—April 26, 1924, W. H. D., a white man, 72 years of age, a farmer, had two circinate granulating ulcers of 16 months' duration in the right gluteal region. They were about 4 cm. in diameter. The discharge laden with yeast-like cells was substantial evidence of blastomycosis. The lesion responded promptly to filtered radiation, excision of the granular tissue and iodid medication.

Case 6.—May 24, 1924, M. T., a white male, 34 years of age, a poultry dealer, presented a small ulcerated lesion in the left pre-auricular region and a warty excrescence near the angel of the jaw on the same side. These were of seven weeks' duration. The multiplicity of abscess cavities, and the violaceous border led to a search for yeast cells, which were readily demonstrated. Unfiltered radiation, destruction by electri-coagulation and iodids by mouth caused permanent recovery.

Case 7.—August 12, 1924, F. W. P., a white man, age 31 years, a farmer, presented a small sore on the base of the right thumb. It had originated as a pustule two months before. Microscopic examination revealed yeast-like refractile bodies. There was complete disappearance of the ulceration after unfiltered radiation and the exhibition of potassium iodid by mouth.

Case 8.—August 28, 1924, J. W. C., a white male, 69 years, solicitor, presented a foul, crusty lesion which covered the greater portion of the back of his right hand a similar one on the outer surface of his right ankle. These had existed for seven months. The ulceration on the ankle was about 3 cm. in diameter. The characteristic miliary abscesses on the back of the hand contained typical mycetic organisms. He slowly

Fig. 6, Case 2.
Result after two and a half months treatment.

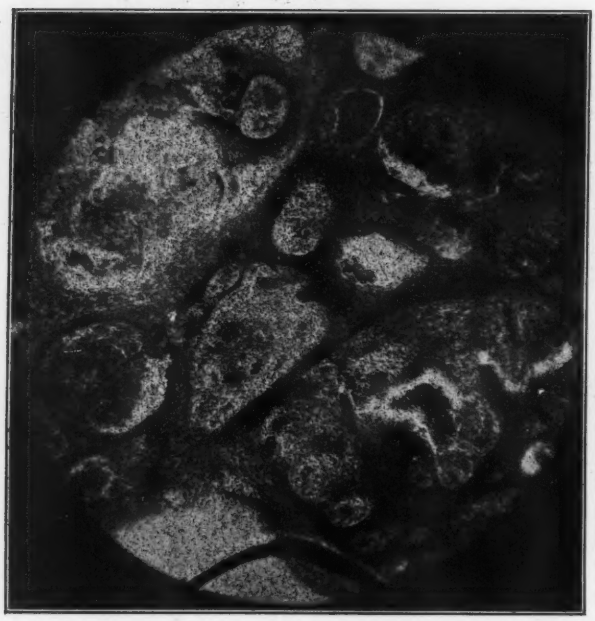

Fig. 7.
Low magnification of blastomycetic tissue showing epidermal hyperplasia, multiple abscesses with giant cells.

recovered after the use of unfiltered radiation, electrocoagulation of the granuloma, and oral administration of potassium iodid.

One is unjustified in drawing any dogmatic conclusion from a small group of cases. However, this group appears to indicate clearly the great importance of early diagnosis and perseverance in treatment. All of the cases occurred in white men, and five of them were farmers who routinely fed and handled live stock. Two of the remaining three had used horses in their occupation. Most of these cases occur in people who are in poor circumstances and who are difficult to control. There is very little doubt that the first case could have been cured by better management. It was impossible to convince him of the necessity of treatment at regular intervals. The second case illustrates the value of accurate diagnosis and shows that extensive involvement can be alleviated by diligent adherence to heroic treatment. However, sufficient time has not elapsed to determine the permanence of results in his case. Nevertheless, he has been greatly benefited and recovery is probable. The last six cases had less extensive involvement and have all made uneventful recoveries.

There is nothing unusual in the plan of treatment used in any of these cases. It consisted of radiation of the entire area, removal of the granulating tissue, and iodid medication. The more extensive lesions have received an erythema dosage of filtered radiation. The smaller lesions have been handled in a manner similar to the treatment of an epithelioma, coupled with iodid therapy. Approximately three skin units of radiation were followed by the removal of the granuloma. The lesions of the first few were curetted. The idea has been advanced that curettement may tend to promote metastasis. It seems that preliminary radiation should eliminate this danger. The structure of a blastomycotic process is such that curetting is very easily done. The soft granular tissue rests on a tough fibrous base which allows the softer tissue to become detached without much effort. The method of removal in the last few cases may be more desirable than curettement. Destruction of the lesion by cauteriza-

Fig. 8.
High magnification of blastomycetic tissue showing yeast-like body in giant cell.

tion or by electrocoagulation has given very satisfactory results.

In conclusion, it should be announced that the second case was reported by Drs. Caplan and Litterer, of the St. Thomas Hospital staff, in the March issue of the *Tennessee State Journal*. An expression of gratitude is due Dr. Caplan for his untiring efforts in the treatment of this case and to Dr. Litterer for a careful microscopic study of laboratory material.

DISCUSSION (Abstract)

Dr. Garold V. Stryker, St. Louis, Mo.—Blastomycetic dermatitis is clinically well established, and the diagnosis is largely a matter of experience. However, there is a tendency to include some diseases under the blastomycetes which, after a study of the causative organism, cannot be included in this class.

In a recent study by Fleisher and me on the organisms in two cases of so-called erosio interdigitalis blastomycetica seu saccharomycetica (in press, *Journal of Laboratory and Clinical Medicine*), we were unable to classify these organisms as blastomyces or saccharomyces, but they were monilia. A review of the literature proved very unsatisfactory. All but a few authors classified the organisms found without stating how they had arrived at their conclusions. It should be remembered that not all oval, double-contoured organisms in the skin or secretions are blastomyces, but they may fall into the class of saccharomyces, cryptococci, monilia, oidium, etc., depending upon the characteristics demonstrated in culture.

It is a confusing practice to call any organism of this type by a specific name unless it has been demonstrated to belong to that class.

Dr. Bedford Shelmire, Dallas, Tex.—I would like to ask Dr. Hamilton if he has had any experience with intravenous iodin in the treatment of blastomycosis. I have recently had a rather startling cure in a case of sporotrichosis treated with Lugol's solution intravenously. A case which was clinically actinomycosis, although the fungus was never demonstrated, responded as well to this treatment. In both cases 0.5 to 2 cc. of Lugol's solution, well diluted with distilled water, was injected into an arm vein every other day. Both cases were well in about three weeks. I have failed to find any reference to the subject of intravenous iodin therapy in any of the American journals. The Indian journals are rather replete with articles dealing with intravenous injection of tincture of iodin in small doses, and several French authors have reported beneficial results in sycosis barbae from intravenous injection of small quantities of Gram's iodin stain.

Thus far my experiments are few, yet any dose of Lugol's solution of less than 3 c.c. is not lethal for the rabbit. I have given a 70 kilo man as much as 12 c.c. of Lugol's solution intravenously at one injection. In some 50 such intravenous injections in the human, in doses ranging from 1 to 12 c.c., I have not observed more than a transitory reaction. It may be that the same beneficial results may be secured from the employment of this therapy in cases of blastomycosis.

Dr. J. M. King, Nashville, Tenn.—The diagnosis and treatment of the surface lesions of blastomycosis at present is quite well understood. So far very little has been accomplished in the treatment of internal infections. Eighteen cases have come under our care from Nashville and the surrounding country with one fatal termination which no doubt was due to internal infection. This patient had numerous body lesions, also lesions about the eyes and mouth, and finally developed lesions of the throat from which, in all probability, pulmonary infection took place with an early fatal issue.

My first case was in 1905 in a man with marked papillomatous lesions over the back of the left hand extending up half way to the elbow on the forearm. At that time I had not any line of treatment laid down. Under an anesthetic the entire infected area was curetted with a sharp curette down to firm tissue. The oozing which was profuse was checked with very hot fomentations. Pure carbolic acid was mopped over the entire area followed after a few minutes with alcohol. Antiseptic dressings and the application of x-ray with iodid internally brought about a complete recovery.

All subsequent cases have been treated in the same way except that the actual electro-cautery has been applied instead of carbolic acid with good results. Small single lesions will yield to the curette, cautery and x-ray combined without iodid. If the organism is destroyed locally, there is no indication for iodid. But with large lesions or multiple lesions iodid in some form should always be given as Lugol's solution, sodium or potassium iodid.

Dr. Oliver S. Ormsby, Chicago, Ill.—In Chicago and vicinity, for some years this disorder has been decreasing in frequency. Occasionally resistant cases are encountered, and in these we employ arsphenamin, using a period of about five injections, then return to potassium iodid again. Radio-therapy is useful in combating resistant foci. We have not recommended surgical measures, except in well circumscribed areas, since having seen general dissemination follow surgical removal of a lesion some years ago.

The superficial yeast infections which have been extensively studied abroad for the last several years, some of which are classed with blastomycosis, are very different from the cases reported today. The former are superficial inflammatory conditions, while the latter are deep-seated processes presenting the picture of the infectious granulomata.

VALUE OF ROENTGEN EXAMINATION IN DISEASES OF THE ESOPHAGUS*

By J. PAUL *and* D. Y. KEITH, M.D.,
Louisville, Ky.

The value of the roentgen ray cannot be fully appreciated by any of us unless we review the methods of diagnosis of diseases of the esophagus before the present fluoroscopic technic was fully standardized.

No one familiar with the presentday accurate, rapid, roentgen methods of diagnosis would contradict the statement that the roentgen examina-

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tion of the esophagus surpasses all other examinations combined. Especially is this true in regard to the comfort of the patient and the satisfaction of the physician. There is no fear of injury on the part of the patient, and the method is quite a rapid one for the physician. We, as roentgenologists, should broadcast the information to the general practitioners and laity until the first thought is of a fluoroscopic observation of any one who is experiencing difficulty in swallowing.

We feel sure that all of you are acquainted with the more common lesions of the esophagus, namely, diverticulum of the upper esophagus, foreign bodies, cardiospasms, benign and malignant strictures. Therefore, we shall confine our remarks to two other lesions, namely, pharyngo-esophageal carcinoma and diverticula of the lower third of the esophagus, which are encountered infrequently.

PHARYNGO-ESOPHAGEAL CARCINOMA

Our observations in a limited number of lesions in this portion of the esophagus have been that in the early cases a differentiation must be made from numerous normal irregularities and extrinsic pressure causing irregular occlusions that may simulate the irregularity of malignancy. The most frequent extrinsic causes are cervical lymph node tuberculosis and malignancy of the thyroid.

In a few instances the clinical history and physical examination with careful observation of the patient have been necessary for final conclusions. Organic and spasmodic strictures are rarely encountered above the introitus. When observed, they are smooth in contour and easily differentiated.

The characteristic appearance, like malignancy in other portions of the gastro-intestinal tract, is the constant rat-eaten irregular filling defect. Rarely there is a little dilatation above the stenosis, though frequently there is present a small sac with a small diverticulum.

With the history of dysphagia usually over a period of several months, and rapid loss of weight with intrinsic irregularity, the diagnosis is unmistakable.

We, as roentgenologists, have not educated the average busy physician in regard to the value of an early fluoroscopic examination for every patient who has increasing difficulty in swallowing solid foods. This with rapid loss of weight is strong clinical evidence of esophageal malignancy. This is especially true if the patient is a male, for the greater number of patients seen with esophageal carcinoma are males.

We should insist on the value of the use of barium sulphate in mucilage of acacia for the first three or four swallows, to be followed with the usual barium solution in cultured milk or other suitable media.

DIVERTICULA OF THE LOWER ESOPHAGUS

Diverticula of the lower third of the esophagus, the so-called deep-seated diverticula, is quite a rare lesion, which is illustrated in the following case report:

A woman, 55 years old, married, had five children, all in good health. She weighed at the time of examination about 85 pounds. She stated that she had always been underweight and that, as a child, she frequently had attacks of indigestion. She was told by her mother that she never appeared hungry and vigorous like other children, and always had to be coaxed to eat the proper amount of food.

For years she had had frequent eructation of gas, sour stomach and an uncomfortable feeling in the lower portion of the chest. Quite frequently, during the ingestion of food, she had been in the habit of placing her finger in the throat to obtain relief by eructation of gas. Frequent attacks of fullness in the throat with a choking sensation was experienced. She always slept with her head lower than her body, with a towel near her mouth to collect the enormous secretion present. It was evident that she emptied the esophageal pouch by assuming this position.

Her present illness began one week previously following the ingestion of kale greens and began with vomiting and the inability to swallow or retain any food. The odor of the vomited material was persistently foul and dark in color, suggesting the presence of old blood.

Examination revealed a very small, poorly nourished patient, almost cachectic in appearance. She was first seen for roentgen study on December 19, 1924. Following is the roentgenological report:

Fluoroscopic Examination of the Chest.—Nothing abnormal was noted in the contour of the heart or aortic shadows. The lung fields were clear, with normal contour of each diaphragm. The tracheo-bronchial lymph nodes appeared increased in density, probably on account of the size of the patient with the emaciation that was present. The costophrenic angles were clear.

Barium Meal.—On ingestion of barium a large diverticulum or pouch to the right and posterior to the esophagus was seen to fill. It was 9x5 cm. in size and 3 cm. above the cardiac orifice. Immediately after this pouch filled, another pouch 6 cm. above the diaphragm and to the left of the esophagus was seen to fill. This diverticulum was 6x5 cm. in size. The lower two-thirds of the esophagus above the pouches was then filled. Later a small portion overflowed into the stomach, which filled normally. When observed in the usual oblique position, the lower right sac was found to be posterior, and the upper left was anterior to the esophagus. The opening or mouth of the upper pouch appeared much larger than the mouth of the lower pouch.

Six-Hour Observation.—The left sac was completely filled, the right partially. By change of position, the right sac could be filled.

In the Trendelenberg position, it was impossible to empty the diverticula through the esophagus into the mouth. Barium was present in the stomach, cecum and terminal ileum. There was little change in the position or in the amount of barium at the 24-hour observation.

Daily observations were made until the tenth day when the upper right pouch was almost empty and the left pouch was empty. An attempt was made daily by the gastro-enterologist to insert a duodenal tube into the stomach for feeding purposes, which resulted in failure until the fourteenth day. The tube always entered the lower pouch and curl upon itself like a ureteral catheter in a diverticulum of the urinary bladder.

The patient gradually grew weaker on the rectal feedings and feeding through the tube was unsatisfactory on account of a pressure ulcer in the mouth from irritation of the tube. On January 24, 1925, under novacain anesthesia, a gastrostomy was performed. Improvement was noted by direct feeding for a few days only. The patient died six weeks after entering the hospital. No autopsy was obtained.

In the literature at my command, only one case of diverticulum of the lower third of the esophagus was reported, in which roentgen films were shown. This case with a small sac was reported by Datchler,[1] in the *American Journal of Roentgenology.*

Carman[2] speaks of this condition as deep-seated diverticula, and refers to only 14 cases seen since the appearance of Bordoni's[3] article in 1892. In the twenty-seven years (1892 to 1920) Carman reports only 14 cases from which his statistics were compiled.

A careful search of the literature on this subject for the past twenty-six years in the surgeon general's office[4] reveals that no case is recorded in which a double diverticulum of the lower third of the esophagus was present. This includes autopsy records as well as the roentgen literature.

Congenital defects are given as the causative roll in deep-seated diverticula, although mediastinal, intra-thoracic or esophageal trauma may result in the formation of a diverticulum. Infection to the structures immediately surrounding the esophagus, with fixation, is given as a possible cause. The right anterior wall is mentioned as the most frequent location for diverticulum in the lower third of the esophagus.

In the case reported, one pouch is found in the right posterior wall, while the left and apparently the larger, and evidently having the largest mouth, is in the left anterior wall. Both sacs are demonstrated well above the diaphragm, there being little question of a correct diagnosis of esophageal diverticula.

Many cases of gastric and duodenal diverticulum are on record, many of which are multiple.

This case is exceptionally rare in that it is a double diverticulum, both of large size and in a female patient.

Of the 14 cases compiled in Carman's statistics, only two were in females, and in no cases are double sacs of large size referred to.

The difficulty encountered in passing a tube into the stomach was evidently due to infection, followed by swelling, edema and almost complete occlusion of the canal of the esophagus.

In none of the fluoroscopic observations or in any of the films was there any rat-eaten irregularity noted suggesting a malignancy.

We feel quite sure, if more careful and more frequent roentgen examinations were made of patients suffering with dysphagia, more cases could be placed on record at a much earlier stage of the disease, when treatment would be more effective.

Let us again insist on the advantage to be gained by the use of mucilage of acacia as a vehicle for barium in the examination of all esophageal lesions.

When the clinical symptoms suggest esophageal occlusions and your first examination is negative, insist on a re-examination, for the sac may be filled with food or secretion and prevent the barium from entering the pouch.

If anyone present has seen a case of deep-seated diverticulum of the lower third of the esophagus, we trust he will add it to this report.

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TROPICAL DISEASES AND PUBLIC HEALTH

SOME PROBLEMS OF MILK PRODUCTION IN THE SOUTH*†

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Twenty-five years ago the dairy industry was to a great extent dependent upon soil, seasons and climate. Today scientific dairying has freed itself from these and other adverse influences and has risen through a phenomenal growth to become a most profitable major branch of agriculture. The consumption of milk and milk products has correspondingly increased.

It is easy through malice, ignorance or negligence to water, skim, adulterate or produce dirty and even infected milk which constitutes an inferior or dangerous food. The detection and correction of these practices is generally the duty of the local department of health and is of great importance to the producer and to the consumer. It follows that the producer, the dealer, the consumer and the local control agency are intricately involved in the milk industry and it is generally accepted that their duties and relationships shall be set forth in law, preferably by local ordinance. Each of these, including the law, constitutes a major problem.

(1) *The Average Producer.*—The average producing dairyman is poorly equipped by education, by experience or by ideals to perform his task properly. Generally he has drifted into dairying, which pays off regularly, from other agricultural pursuits, which pay off annually, if at all. The never ceasing daily grind of dairying prevents loafing, demands steady work and provides a constant cash return which holds the average dairyman on the job for about ten years. If he owns his own farm, as one-half of them do, he will remain in the business more than twice as long as the renter. Two out of three move once each four years and two raise no feed or calves.

Five times out of six the average dairyman has no other duties to perform. He keeps no adequate records and knows next to nothing about costs, bacteria and the requirements of the ordinance under which he operates.

His farm has 68 acres of land, is located ten miles from town and he travels thirty miles per day over his route, delivering thirty-eight gallons of milk drawn from twenty milking cows in a herd of twenty-five and, with luck, collects a maximum gross income of $22.80 per day. From this sum he must manage to pay all his bills, rents and depreciation, and have a margin left to his family for his labor and trouble, or else dairying is unprofitable and must be discontinued. It is seen from this what a slender financial thread sustains the milk supply of our southern cities, and any control measures that ignore this fact will be unenforcable because they are destructive to dairying.

The producer who sells his milk to a dealer does not differ materially from the producer who sells direct to the consumer except that his interest in the quality of the product he markets soon entirely vanishes if it ever existed.

(2) *The Average Milk Dealer.*—The average milk dealer will purchase any quality of milk offered for sale from any source at the lowest cost. Such milk will be passed through a dirty pasteurizing plant in a haphazard fashion with inadequate control of the heating and cooling processes. He will seek the exclusive right to foist this product onto the discouraged, rebellious consumer under the name of safe milk.

(3) *The Average Consumer.*—If the consumer is young and defenseless it will accept almost any milk provided for it and later offer a protest against the colics and diarrheas and malnutritions which result from the continued use of inferior decomposing food. If the consumer is older and in possession of his faculties the milk is refused except for cooking. By so much the industry is discouraged, even destroyed.

(4) *The Average Control Official.*—The average control official is employed for some other

*Read in Section on Public Health, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

†This paper is based on the bulletin "A Study of Memphis Milk Supply." A few copies are available on request.

reason than that he is interested in, or understands the important task which opportunity has placed in his hands. He and his superiors grope in their ignorance of the problems of the producer, the dealer and the consumer, and by punitive procedure against the producer or dealer shut out the last hope for improvement. The integrity, energy and ability of the control officials determines to a greater extent than any other factor the quality of milk sold in a community. They can by firm fair measures encourage, even force dairymen and dealers to produce and deliver a high quality milk, and with such a supply available the consumer needs no other encouragement to do his duty, drink milk.

(5) *The Law.*—The rules of the milk game, the local milk ordinance, should be simple in construction, logical in arrangement, explicit in expression and instructive to those whose business it regulates. Dairy farming as well as the production of safe milk prosper most when built upon a healthy herd and therefore all cows producing milk for human consumption, raw or pasteurized, should be regularly tested for tuberculosis. It should require a minimum of essential equipment of a prospective dairyman before he is permitted to distribute milk. Approved methods of operation should be clearly outlined and specific standards of quality should be set up. All dairymen should operate under permission. Penalties, revocation of permits for cause, and rating publicity should be provided for.

The sale of certified milk, raw milk and pasteurized milk should be allowed. When milk dealers have, by keeping the faith and by their performance, demonstrated to the consumer that pasteurized milk can be, from the consumer's standpoint, as desirable a product as raw milk the ordinance should then be modified to favor the sale of pasteurized and discourage the sale of raw milk. Before this quality of pasteurized milk is available, the sale of raw milk should enjoy the same advantages as pasteurized milk, otherwise the use of milk will be restricted and the damage, especially to young, growing children, will be greater from the use of too little milk than is the danger of specific disease transmitted by a good quality of raw milk used in quantities adequate to supply all of the nutritive needs of the community.

CONCLUSIONS

(1) Satisfactory improvement in the milk supply of the average southern city depends upon the integrity, energy and ability of the local control officials to a greater extent than upon any other single factor.

(2) There are no unsurmountable obstacles in the way of bringing the average dairyman into possession of the necessary equipment, and the use of methods which will enable him to produce a high quality of relatively safe milk at a reasonable cost to the consumer after a fair profit is added to the cost of production.

(3) There are no merchandising difficulties connected with the sale of such milk either raw or pasteurized except where an inferior product has previously been sold.

(4) Probably pasteurized milk is good insurance against the spread of milk born disease, and consequently a great safeguard to a milk business, but where abuses have occurred, time alone can change the consumer's aversion to pasteurized milk.

(5) Where high quality, safe milk is sold, the consumer needs but little further encouragement to do his duty, creating a demand for milk which will make the milk industry pay dividends in cash to the producer and the dealer and dividends in better health and improved nutrition to the consumer.

(6) The rules of the game, the milk ordinance, should be simple, logical, explicit and instructive. Minimum requirements should be clearly stated which must be met by all dairymen. The sale of certified milk, raw milk, and pasteurized milk should be provided for.

(7) The special problem of temperature and cooling is not dealt with in this paper.

City Hall

DISCUSSION (Abstract)

Dr. F. J. Underwood, Jackson, Miss.—The problems of milk production in the South are of paramount importance and must be given serious consideration before any regulatory measures of milk control are adopted. The economics of milk production are so closely interwoven with quality and quantity that if we would have quality and quantity both, we must give most earnest consideration to the handicaps our average producers labor under. An adequate milk supply is almost, if not as important as a clean milk supply, if we are to accomplish all we aim to in the broader sense of our milk control work. We constantly advocate the consumption of more milk because of its peculiar benefit to mankind. But if we lose sight of all our aims in milk control work, we are apt to cause a decrease in production for a variable increase in quality, resulting in a possible greater harm to the public. It cannot be said that all our milk control work has been wisely directed or based upon logical and practical regulations, or enforced by honest and intelligent officials.

The milk ordinance should be simple, logical, explicit and instructive. Minimum requirements should be stated, which must be met by all dairymen. The ordinance should allow the sale of certified milk, raw milk and pasteurized milk. It should require all cows to be tuberculin tested. The use of numerous grades is questioned as they more often work a hardship on the producer and put him in a frame of mind that he is being harrassed by a lot of unnecessary detail. Furthermore, the grades often prove confusing to the consumer who can see no difference between them. The difference between the bacterial content allowed for the various grades sometimes falls within the range of experimental error in the laboratory methods of estimating numbers of bacteria. Also the differences in the bacterial limits represent no detectable differences in quality. Cleanliness is one of the most significant factors in the production of clean milk, and this is within the reach of every dairyman, even though his equipment and general conditions represent small investments. The ordinance should provide for safeguarding the sanitary equality of the few kinds of milk which the demands of the consumers have dictated and this can be accomplished without multiple grades.

The economic status of the dairyman increases when the quality of his product increases. When the public can be reasonably sure that the milk supply is relatively safe, confidence is established with an ever increasing demand for milk. This fact is amply demonstrated wherever satisfactory milk control is attained. Only recently the Parent-Teacher Association in one of the wealthiest counties in my state voted funds to furnish free milk daily to the undernourished children in the schools in the county. Later when they sought the supply they were so surprised at the insanitary condition of their dairies that they refused to go on with their undertaking. This incident, however, has served to hasten the coming of milk control and has caused the more enterprising dairymen in the largest city in the county to demand an adequate milk control program.

The law of supply and demand does not always operate in the true sense of its meaning when the commodity milk is considered. The actual need of the human race for milk as a food is ever present, but the consumption does not always meet that need. In other words, the demand is ever present, but the supply, regardless of how plentiful or scarce, will not be greatly in demand if the quality is not high.

Dr. J. Ross Snyder, Birmingham, Ala.—Dr. Durrett admits "the average producing dairyman is poorly equipped by education, by experience and by ideals properly to perform his task!" How does he reconcile this statement with his conclusion that "there are no insurmountable obstacles in the way of bringing the average dairyman into the possession of necessary equipment and the use of methods which will enable him to produce a high quality of relatively safe milk at a reasonable cost to the consumer." I have been quite willing in this milk fight to move forward slowly, tactfully, and patiently. But in every community with which I am familiar, whenever milk regulations and dairy inspections are started, there is a certain proportion of the dairymen, who become vicious. I have in mind now a notorious dairyman in Alabama, who was indicted for participating in the thugging of our local health officer; a dairyman who later was wounded when he attempted to thug a negro against whom he had a personal grudge; and who still later shot down and killed a youth without giving the latter a dog's chance. Steeped in crime he seemed immune to punishment until he killed this boy. Then he was given a light sentence in the penitentiary. The supposition is that a nefarious political organization had even corrupted our judiciary. He served a short term in the penitentiary and then a pee wit governor pardoned or paroled him. He returned to Jefferson county and within a few weeks was discovered to be watering his milk. He remains out of jail. It was remarkable to witness the delight of a rather large proportion of our dairymen over failures to convict and to punish this criminal. Dr. Durrett is right that "the average producing dairyman is poorly equipped by education, by experience, and by ideals." When you start to enforce a milk regulation ordinance some of the dairymen must be put out of business.

In Jefferson County the work of the Health Officer, Dr. J. D. Dowling, has had the following effects:

"(1) Due to the clean-up in the milk supply and the enhanced confidence of the public in its safety, there has been an increase of 150 per cent in the consumption of milk in Birmingham within the past four years, as compared with 8 per cent increase in human population.

"(2) The dairymen have reaped the greater part of the benefit in that there has been a corresponding increase in the production of milk in Jefferson county during said period.

"(3) Four years ago 50 per cent of Birmingham's milk supply was adulterated to the extent of 10 per cent added water, costing the citizens of Birmingham an estimated total of $94,000 per annum for water added to their milk supply. Today adulteration has been practically eliminated.

"(4) Prior to the adoption of the present milk code, there was no official grading of milk in the City of Birmingham, and approximately 90 per cent of the supply was sold in raw state. The remaining 10 per cent was subjected to so-called pasteurization, which was performed without control, and in a manner that brought pasteurization into disrepute in this city. Today we have the following official grades:

(A) Certified Milk which represents 3 per cent of the total supply; Special Pasteurized Milk, this grade is not being taken advantage of at the present by plants in this city, and no special pasteurized milk is on the market; (B) Standard Pasteurized Milk, representing 6 per cent of the supply, is produced from tuberculin tested cows on inspected premises meeting definite sanitary requirements, and having a bacterial limit of 1,000,000 per c.c. prior to pasteurization, and subsequently, distributed with a bacterial count not exceeding 50,000 per c.c.; (C) Special Raw Milk is produced from tuberculin tested cows on dairies meeting high sanitary requirements, and containing bacterial limit not exceeding 20,000 per c.c.

"(5) The average bacterial content of raw milk for 3 years prior to November, 1921, was 780,000 per c.c. Today, the bacterial content of raw milk sold in this market will average less than 20,000 per c.c.

"(6) Prior to the adoption of the present Milk Code, the average bacterial content of pasteurized milk exceeded 200,000. Today its average bacterial content is less than 50,000 per c.c.

"(7) Incidental to milk control, it is significant to note that the typhoid rate has decreased in the past four years from 75 per 100,000 to 7.5. Similarly, there has been a decrease in the colitis rate in infants under two years, from 180 per 100,000 in 1918, to 39 in 1924. The colitis rate in 1921 was approximately 46, and the decrease between 1918 and 1921 may be more probably attributed to the division of child hygiene. The colitis rate in 1922, after a year of our most intensive mail work, was 25, the lowest on record for the City of Birmingham, and it is significant to know that 1923 and 1924 constituted a period when milk control was jeopardized through several milk fights, which to some extent may be attributed to the increase of colitis rate in said two years.

"(8) During 1924 and 1925, there has been a campaign to eliminate through appropriate laboratory examinations of feces and urine, all typhoid carriers. The first survey of several hundred persons employed revealed the fact that approximately 4 per cent of the persons examined were typhoid carriers, and were definitely eliminated. Subsequent surveys have shown that typhoid carriers at the present time are discovered at intervals few and far between.

Dr. W. L. Holt, Little Rock, Ark.—I wish to make a plea for the standard milk ordinance which has been adopted by the states of Alabama, Louisiana and over fifty cities in the South. The two chief features of the ordinance are the grading of both raw and pasteurized milk, and the requirement that either all milk be pasteurized within 12 months of date, or all but Grade A. The members of this section should hardly need to be reminded of the fact that the only really safe milk is properly pasteurized milk. The best known argument for this is the great epidemic of about 1,000 cases of septic sore throat which occurred in the suburbs of Boston in 1913, which caused over 50 deaths. This was on a high grade raw milk supply.

In regard to grading milk, it is, of course, true, as Dr. Durrett says, that the public will not appreciate the difference between the grades until they have been educated for some time. However, New York, Chicago and many smaller eastern cities have so graded their milk for 12 years or more. I see no reason why all milk, varying greatly in quality, just as apples, eggs, etc., should be lumped together and sold as simply milk. I also believe that the grading of milk spurs the producers to improve their methods in order to get into the A class and stay there.

In answer to the stock argument that compulsory pasteurization of all but Grade A milk works a hardship on the poor dairyman, I would say that our records for October show that 50 per cent of our hundred odd dairymen would be in the Grade A class already, and my milk inspector is satisfied that at least 90 per cent of them could attain this grade, under 50,000 bacteria, in a short time, if they had to choose between that and pasteurizing.

Dr. H. S. Mustard, Murfreesboro, Tenn.—May I stress that in addition to equipment we must not lose sight of method as a need in the production of safe milk. The two things are, of course, closely related, but it is upon method that the satisfactory operation of equipment is dependent. The best pasteurizing plant is ineffectual if not properly operated, and the best equipment for cooling is of little value if the individuals do not properly make use of it. In method, too, the human element comes into play and the human being is more dangerous than unesthetic environment. A pile of manure near the dairy barn, while subject to dramatic demonstration by photograph, is not nearly so serious as a sore throat or typhoid carrier among the personnel. These remarks are made with no idea of deprecating the value of equipment, but rather to urge the importance of observation of the state of health and the carefulness of procedure of the individuals who handle the equipment.

Dr. Roy K. Flannagan, Richmond, Va.—The Virginia State Board of Health has adopted the Standard Milk Ordinance recommended by the United States Public Health Service and we are gradually securing its adoption by the cities and towns of the State. It will be some time yet, however, before we can put on a milk consumption campaign in any wide-spread fashion, since control is too inadequate and milk is not yet a uniformly safe food.

As milk becomes more and more satisfactory in the various municipalities we expect to aid them in every way to secure increased consumption. We owe this not only to the people, since clean milk is a perfect food, but to the producers who cooperate with the health departments by improving its sanitary quality.

Dr. Durrett (closing).—Dr. Underwood raises the point of grading milk. We tried grading milk for three years in Memphis and could make but little progress. When the grading ordinance was changed so that we allowed certified, raw and pasteurized milk with minimum requirements for each, most of our serious troubles ended.

Family cows in Memphis, have, in four years' time, been reduced at least 46 per cent, attributable to the fact that an adequate supply of good quality milk can now be purchased which was not true formerly.

Dairy farming must pay or the dairyman must quit business. I own a dairy in Alabama and keep accurate books on its operation. You frequently hear it stated, by those who do not know, that it costs no more to produce good milk than poor milk. The cost is greater and individual production items which are increased are very interesting but cannot be discussed here. The added cost is partly repaid by better customers and less loss of milk.

Dr. Snyder raises the point of adulteration and understandard milk. A vicious dairyman, who waters and skims his milk, should be eliminated by the revocation of his permit. In this way we have stopped about seventy-five dairymen in Memphis without a single court action. Adulterated and understandard milk (some Holstein milk) has been, under this procedure, reduced from 18 per cent of the total supplied to Memphis in 1920 to 2.7 per cent supplied in 1925. This last figure represents almost exclusively understandard milk from Holstein herds unable to reach the 3.5 per cent butterfat standard. Adulteration and skimming has practically ceased because it is not tolerated.

Both an adequate quantity and a high quality milk have an influence on the diarrheas and enteritis of childhood. Where an adequate quantity of milk is available it replaces other less desirable foods and if the quality is good the diet of the child is greatly improved.

Dr. Snyder does not seem to understand that even dairymen with poor equipment, little experience, poor education and few ideals can be improved greatly in all of these deficiencies by an intelligent, sympathetic contact with a department of health determined by fair means to enforce the fundamentals required in improving the milk supply.

Dr. Holt raises the point of bacteria in milk. The number of bacteria per cubic centimeter in milk depends mainly on three things; (1) cleanliness of methods and utensils, (2) the time since milking, and (3) the temperature at which the milk has been held. The number of bacteria is no indication as to whether or not the milk is capable of producing specific diseases. Some so-called pasteurized milk has been known to cause epidemic diseases.

Dr. Flannagan raises the point of law enforcement. The law, of course, should be enforced and to this

end it should be specific in its requirements and easy to understand. Nearly all court procedure can and should be avoided. No dairyman has been arrested in Memphis since August, 1920. Remember that a good milk supply does not lie wholly in a law or in its enforcement. The enforcing official must understand the detailed specific needs of each producing and distributing dairyman and must guide him to a solution of most of his problems by sympathetic measures. Force of law is the very end procedure and when used it is destructive to cooperation in dairy control work. When such procedure can no longer be avoided the elimination of the dairyman should be the ultimate aim in most instances of the legal course adopted.

My advice to local health officials who have milk control problems to work out is to secure if possible a simple, direct easily understood ordinance, to guide their procedure and aim at the securing of milk safe for children to drink, and in a quantity sufficient to meet the demand. At no time must he forget that a dairyman requires a profit on his business or else he is an impossible man to deal with from the standpoint of increased production and improved quality of the product which he delivers.

MODERN CITY HEALTH DEPARTMENT PRACTICE AND THE MEDICAL PROFESSION

By A. H. Flickwir, M.D.,
City Health Officer
Houston, Tex.

City health department practice today is vastly different from that of 1864, as Dr. Stephen Smith of New York, the first president of the American Public Health Association, recalls it in his memoirs published in 1921. Dr. Smith states that in those days the Board of Health of New York was not composed of physicians, but made up of aldermen, and when a citizens committee called upon Mayor Fernando Wood to call a meeting of the board to take measures to prevent the spread of cholera, the mayor replied: "I will not call the board, for I consider it more dangerous to the city than cholera." He did, however, appoint a health commission consisting of physicians, out of which the Metropolitan Health Board was formed, to consider disease prevention, particularly those measures applied to the control of cholera.

In those days and really not so very long ago, the health officers' duties in many large cities were given over largely to the posting of signs, shot-gun quarantine for smallpox and yellow fever and the removal of dead animals.

Only a few years ago while I was in the midst of a mosquito control program, I was told by several old-time citizens that they didn't believe the mosquito theory of the transmission of dengue and yellow fever, and that what I should do was to clean the streets and spread lime about; that such was the approved practice during yellow fever epidemics in their day and that prominent physicians of that period had stated that lime was the disinfectant to use to prevent yellow fever.

In New York the mayor appointed the health commission of physicians and in the old citizen's day the prominent physicians who were members of the health boards then had told him that decayed animals caused yellow fever and he remembered it to this day, because a doctor had told him and a doctor had been connected with the public health. For a long time it was believed by everybody that preventive medicine should keep its hands off curative, and vice versa, and some of the practicing physicians still think so. Also, there are a great many lay individuals who cannot see how a physician can be interested both in the cure and in the prevention of disease.

I do not subscribe to either of these theories. I believe that preventive medicine and curative medicine are so closely linked together that physicians of the future should be informed on both subjects, specializing in one or the other. The medical profession of this country should be at the head of all public health movements and the foremost positions in city, county and state health departments should be held by persons holding a degree of Doctor of Medicine, or Bachelor of Medicine, as the English have it.

Modern city health department practice calls first for a full time health officer, meaning one who is not engaged in the practice of medicine for his livelihood, but who depends entirely on the salary derived from carrying on his health activities. This, as you all realize, is necessary if the modern municipal health department is going to function to advantage.

The American Public Health Association has recently endeavored to standardize to a certain extent, the large city health department practice through its fellows and its field directors, very much in the same way that the American College of Surgeons has done with our hospitals. This work is new but has promise of being of great assistance in bringing up the

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standard of municipal health department practice.

Modern city health department practice takes in, according to their opinion, the following common activities:

(A) VITAL STATISTICS.
- Registration.
- Classification.
- Verification.

(B) COMMUNICABLE DISEASE CONTROL.
- Reporting.
- Record keeping.
- Control practices.
  - Diphtheria Control.
  - Typhoid Control.
  - Smallpox Control.
  - Scarlet Fever Control.
  - Visits by Doctors and Nurses to cases.
  - Diagnostic Service.
  - Hospitalization.
- Specific Preventive Measures;
  - Diphtheria and Smallpox.

(C) VENEREAL DISEASE CONTROL.
- Reporting.
- Clinical Service.
- Cases Returned to Physicians or clinics.

(D) TUBERCULOSIS CONTROL.
- Reporting Ratios.
- Field Nursing Service.
- Clinical Service.
- Hospitalization.
- Open Air Rooms, Classes, Preventoria, or Day Camps.

(E) HEALTH OF THE CHILD.
- Health of the Child up to School Age.
- Prenatal.
  - Field Nursing Service.
  - Clinical Service.
  - Obstetrical Service.
  - Stillbirth Rate and Infant Death Rate Under one month.
- Infant.
  - Field Nursing Service.
  - Clinical Service.
  - Infant Mortality Reduction.
- Pre-School Child.
  - Field Nursing Service.
  - Clinical Service.
- Health of the School Child.
  - Weighing.
  - Physical Examinations.
  - Defects, Correction of Sanitation, School Buildings.
  - Health Education.
  - Recreation.

(F) SANITATION; FOOD AND MILK CONTROL; WATER; SEWERAGE.
- Sanitary Inspection Service.
- Food Handlers and Food Establishments.
- Milk Supply Control.
- Water; Purification and Distribution.
- Sewerage.

(G) LABORATORY.
- Scope.
- Record of Examinations.

(H) POPULAR HEALTH INSTRUCTION.
- Use of Pamphlets, Bulletins, Press, Lectures and Moving Pictures.

And the following special activities:

(A) MALARIA CONTROL.

(B) PLAGUE CONTROL.

(C) INDUSTRIAL HYGIENE: Sickness Rates.

(D) MENTAL HYGIENE: Clinical Service.

(E) GOITER PROPHYLAXIS: Prophylactic Results.

(F) PERIODIC EXAMINATIONS: Extent of Periodic Examinations.

(G) RESEARCH: Nature and Extent of Research Activities.

(A) *Vital Statistics.*—How is the medical profession concerned? Very materially indeed, as most of our reports of births and deaths, with the exception of those of the midwives, must come from the doctors. This probably causes the health official more trouble than any other department, because, doctors will forget to fill out the blank or forget to mail it, etc., but I am happy to say, they are getting much better, especially since the war, when it was found how necessary it was to be able to prove one's age.

The next subject is *Communicable Disease Control,* and the reporting of such diseases. Here, the health officer must have the co-operation of the medical profession absolutely, in order to complete his epidemiological charts and records, which are so necessary if preventive work is to be carried on, isolation hospitalization and immunization.

C and D. Venereal Disease Control and Tuberculosis Control.—Why shouldn't they be reported and taken care of like other communicable diseases? Here, the doctor is concerned again, both in reporting and in advising adequate treatment.

(*E*) *Child Health.*—Here, we have infant welfare, the pre-school child and school child. There must be a doctor thereabout. Perhaps some outside organization will start the work first and have everything ready to go, discover that they do need a doctor and then come for him last because they cannot get along without him. What good would a child welfare conference be without a doctor or many doctors?

(*F*) *Sanitation; Water, Milk, Food, Etc.*—The medical profession is concerned here. Physicians not only want the best food for their patients, as dietetics are becoming more popular in the treatment of disease, but as the captain of my ship during the war once said to a dealer who complained because I had turned down a shipment of beef: "What did you expect him to do? We are not only taking that meat over to soldiers and feeding it to our crew, but the doctor has to eat it himself."

What is the use of sending one of our young Southern physicians up to Boston or Philadelphia for a year or two to learn how to feed

milk to babies if he cannot get good milk to give them in his own city when he returns.

Public Health Nursing—This is a field which is becoming more popular with the medical profession as it is understood and when it is properly administered. Public health nursing has done more to spread the propaganda of scientific medicine, in my opinion, than any other branch of public health work. While a few of our brethren have perhaps complained because a nurse has occasionally recommended an enema or a dose of castor oil, just stop and think of the nasty infections she has prevented for you in the homes by instructing the mother in asepsis and home hygiene. I need not mention the cases of skin disease, inflamed throat, enlarged tonsils, and other defects, that have been referred to the family physicians.

The American Red Cross and most other nursing associations require the nurses to have their standing orders approved by the local medical society, and city nurses should be under the direction of the local health officer.

The same can be said of medical inspection of school children. Our schools are government institutions and our children, while they are in school, are entitled to be protected from contagious and infectious diseases. I do not mean that they should be treated by the school physician. It is the duty of the family physician to treat them when ill or injured and to correct defects except in the case of the poor. It is the duty of the municipality through its hospital and clinic to care for those who are unable to pay. I have not often directed that a school be closed on account of communicable disease. I have always found that the inspection and health education carried on in the school was superior to the old method of closing it every time a case of diphtheria or scarlet fever was reported.

If the school is kept open the carriers can be discovered and those exposed can be isolated for the period of incubation or immunized and in various manners the threatened epidemic can be checked. We must think also of the daily habit of personal hygiene which is encouraged when a child goes to school, bathed, face and hands washed, with clean linen, takes part in toothbrush drill, etc. In the case of modern city health departments he is allowed to eat only at approved school lunch rooms or cafeterias that have the permit of the department. Most important of all is the outdoor exercise obtained by the walk or ride to the school and the exercise and recreation arranged for the pupil by the physical and recreation department of the school.

(*G*) *Laboratory.*—All doctors are aware of the absolute need of a well equipped laboratory in carrying on health department practice. Water and milk analysis are necessary as well as bacteriology and serology as pertaining to communicable disease and public health.

(*H*) *Popular Health Instruction.*—All health education as carried on by modern health department practice supports scientific medicine and physicians should assist in it as they will ultimately be consulted. They are always the last resort in the treatment of disease and if public health education is supported and furthered, they will be the first consulted.

The special activities, such as malaria, plague, goiter prophylaxis, etc., become important according to geographical location of the cities. I have not the time to go into all of them thoroughly, but in each activity the practice of medicine is in some way directly concerned.

SUMMARY

(1) Modern city health department practice demands a full time medical health officer.

(2) The medical profession should support all worth-while health activities and should exercise control over them by demanding that medical men and women be represented.

(3) Health officers should cooperate to the fullest extent with the local medical society, for without its support no health officer can carry on his work successfully.

(4) Health officers should consider the medical profession at all times and not take from them the patients that are theirs and are able to pay. It is not the function of city governments to enter the practice of medicine except in the control of an epidemic and in the treatment of the poor.

(5) I do not believe in small-fee pay clinics. They should be free for the poor only. When a small-fee pay clinic is established many people attend; some who could otherwise pay a physician, feeling that they are not charity cases because they have contributed a small fee. This tends toward socialization of medicine to which I am absolutely opposed, and which has no place in the scheme of modern health department practice.

(6) Health departments should be under

the direction of medical men and not laymen.

It is not the intention of the writer to underestimate the valuable services rendered to public health by the doctor of public health, sanitary engineer, veterinarian, chemist, bacteriologist, director of physical education and the social worker, as they all are very much needed in the personnel of a modern city health department. But it is the opinion of the writer that the medical profession must take cognizance of public health work and that a member of our profession should be at the head of all modern city health departments.

DISCUSSION (Abstract)

Dr. L. H. Martin, Fort Worth, Tex.—In industrial hygiene all that is necessary in order to secure finances for health measures is to show that the money will be used to good advantage; that direct benefit from every dollar spent will be received. As in other lines of public health, I have often faced a problem of hesitation in going ahead until engineers were consulted. However, my program was usually carried out.

I decided that I would familiarize myself with some of the principles of engineering to overcome some of this. I merely mention this to show that public health work needs some special training on the part of health officers.

Control of transmission of disease depends upon the knowledge of its etiology. Therefore, the physician trained in this particular work is a logical director of such work.

The practicing physician is an important cog in all modern health practice, and he can either be of help or retard the work. On the other hand, he may likewise benefit from modern health department practice through many ways, particularly in the diagnostic service for hygienic diseases; also, in securing in advance many new methods that have proven themselves through research that is being carried on particularly by the United States Public Health Service and International Health Board. Also the health officer helps or takes over the burden of quarantine and release of patients, thereby relieving the physician of any embarrassment that might be prejudicial to his practice.

I also agree with Dr. Flickwir that a director of health work must devote his entire time to his work.

Dr. Oscar Dowling, New Orleans, La.—For fifteen years I have given full time to the work of State Health Officer. It is gratifying to have Dr. Flickwir outspoken in his convictions as to the support that all physicians should give to public health work.

The conclusions of Dr. Flickwir express the relationship of the physician to the health officer and the health officer to the physician in the best possible way. It gives me pleasure to approve of his facts and conclusions.

SURGERY

RAILWAY, INDUSTRIAL, GYNECOLOGICAL, OBSTETRICAL AND UROLOGICAL

ENERVATION OF THE STOMACH*

By J. A. CRISLER, JR., M.D.,
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The role of the gastric nerves in the physiology of the stomach has been studied experimentally, but the clinical application of this knowledge to gastric surgery has received very little attention in this country. In the text books of surgery, in the description of more recent stomach operations and in the analyses of end-results of different operative procedures, one finds little or no reference to the function of the gastric nerves. Is it because the physiologist has not kept pace with the surgeon or because our knowledge of these autonomic nerves has been as vague and obscure as the filaments themselves? Whatever the answer may be, it is this apparent lack of surgical consideration for the gastric nerve supply that prompts me to call attention to the operations for division of the extrinsic nerves and to the experimental evidence of their physiological function.

ANATOMY

Before proceeding with the discussion, permit me to review briefly the relevant surgical anatomy of these nerves. The extrinsic nerve supply of the stomach is derived from the two vagi and the sympathetic by the way of the celiac plexus. The left vagus passes anterior to the cardia and thence along the lesser curvature as far as the pyloric canal. It is situated in front of the artery and lies just beneath the visceral peritoneum. It gives off five or six branches which supply the anterior wall of the stomach. The right vagus has a similar course and distribution to the posterior wall of the stomach, but it gives off fewer branches. The sympathetic fibers come from the celiac and hepatic plexuses and pass in close connection with the blood vessels. From four to six filaments spring from the hepatic nerve and flow perpendicularly on each side of the pyloric artery to be distributed to the pyloric canal. Another group of fibers accompanies the right gastro-epiploic artery along the greater curvature of the stomach. A few sympathetic fibers surround the vasa breva, but they are too small and irregular to be attacked surgically. According to Latarjet there is an anastomosis between the fibers of the vagus and the sympathetic, particularly between the hepatic nerves and the anterior vagus. For the convenience of surgical approach, he groups the extra gastric nerves into three pedicles: First, that of the lesser curvature; second, that of the pylorus; and third, that of the right gastro-epiploic artery. The distribution of the nerves in the stomach wall does not concern us particularly in this discussion, but we should remember that the intrinsic nervous mechanism consists of the plexuses of Meisner and Auerback and of nodal tissue (the nodes of Openchowski).

PHYSIOLOGY

The course and distribution of the extragastric nerves is easily understood but their exact function is difficult to determine. A few facts seem well established experimentally, but to be generally accepted they must have the confirmation of clinical evidence, because physiology worked out on lower animals is not always applicable to man. In order, then, to correlate the experimental work we may review the results of investigation of the nervous control of the stomach.

Cannon working on cats observed no change in the normal gastric movements after splanchnic section, but noted a marked weakness and slowing of the peristaltic waves and a retarded discharge through the pylorus after vagus section. These effects largely disappeared after a few days. After section of all extrinsic nerves the peristaltic waves were almost normal after an initial vagus retardation. The characteristic difference in rate of discharge of carbohydrate and of protein food from the stomach persisted after a section of the nerves singly or entirely. It was therefore attributed to a local control. Carlson showed that stimulation of the duodenal mucosa by anything causes contraction of the pylorus, while water, acids or alkalis acting on the antrum mucosa have no effect on the tonus of the sphincter.

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Borcher, after an extensive study of the vagus influence concludes that the nervous elements of the stomach wall itself possess an important independent function and show at least as regards motility, no direct relation to the vagus. Disturbances of motility observed in hysteria, neurasthenia, tetany, lead poisoning, etc., are attributed to an increased sensibility of the gastric mucosa to all irritation. He believes that the vagus is not the motor nerve of the stomach, but his experiments were carried out under abnormal conditions, that is, on cats under anesthesia with an abdominal window.

Sterlin (quoted from Latarjet) states that the stomach, reduced to the innervation of the vagus, presents strong contractions and empties in two hours, while after division of both vagi, it is put at rest and empties in six hours. He thinks that the stomach possesses in itself the nervous elements to assure its motility and secretion.

Most observers agree that the vagus and the sympathetic nerves have both a motor and an inhibitory effect on the motility of the stomach. Wheelon and Thompson, and Carlson have shown that the extrinsic nerve supply to the sphincters is the same in character and source; that the pyloric sphincter responds to electric stimulation of the nerves in the same manner as the antrum and first portion of the duodenum, while the cardia is under the same nervous control as the lower esophagus. These facts are opposed to the view that regards the gastric sphincters as separate functional entities controlled by special reflex mechanisms.

Carlson finds a great variation in the spontaneous motor activity of the pylorus in different animals and from time to time in the same animal. He shows that the response to stimulation of the peripheral ends of the cut nerve varies with the existing gastric tonus and stage of digestion. However, the predominant reflex into the pylorus from stimulation of the visceral sensory nerves and from some spinal nerves is motor, and if the stimulation is prolonged, the sphincters are thrown into spasm. The main efferent paths for this reflex must be in the splanchnic nerves, for the same result is obtained after section of the vagi. His experience shows that pylorospasm may be induced by irritation of the abdominal viscera. Since it has been shown that the sphincters react in the same way as the stomach, we may reason from his experiments that motor disturbances of the stomach result from three sources: (1) local pathological conditions in the stomach and duodenum; (2) abnormal states of the central nervous system; and (3) irritation of the sensory nerves, particularly those of the abdominal viscera. Furthermore he finds types of pylorospasm that may be relieved by section of the vagus nerve and by section of the splanchnic, and states of atonicity of the pylorus that may be removed by section of the vagus only.

Veach finds that electric stimulation of the peripheral end of either vagus nerve with relatively low frequencies and intensities has motor effects on the stomach of the cat, while stronger stimulation has an inhibitory effect on these structures. He believes that these effects are not produced by the action of functionally different fibers in the vagus trunk, but that they can be explained by the close analogy of the reaction to Widensky inhibition.

> "The increased tendency for inhibition to occur when the smooth muscle is in a state of high tonus and rhythmic activity is therefore accounted for by an increase from an excitatory to an inhibitory frequency of the propagated disturbances already in progress."

In their studies on the action of the vagus on gastric motility in man, Daniolopolu, Simici and Dimitrim report that excitation of the vagus at the neck produces two phenomena in the stomach. The first, which is the exclusive result of vagus excitation is an inhibition which may be due to tetanic contraction of the stomach. The late result which occurs after the excitation is over is composed of a phase of hypermotility followed by one of paralysis.

After studying the nervous control of gastric secretions, Suda thinks that the extra-gastric excito-secretory nerves for the fundus glands are vagus and splanchnic, and the extra-gastric inhibitory nerves are sympathetic flowing in the peripheral vagus trunk but coming really from the stellate ganglion. Bircher and Latarjet note a decrease in gastric acidity after denervation.

After this review of some of the more important experimental work on the function of the gastric nerves, it is apparent that our knowledge of this subject is incomplete and perhaps insufficient to serve as a guide for surgical therapy. However, all gastric surgery has developed without the assurance of complete understanding of gastric physiology, and in certain types of accepted surgical procedures, notably, sleeve resection, the nervous mechanism of the stomach has been interfered with through

division of some of the extrinsic and intrinsic nerves. The unsatisfactory results of local excision of ulcers on the lesser curvature may well be due to interference with this nervous mechanism. Thus we see that the surgical attack of the gastric nerves is not such a new and radical procedure as it may seem.

The internist recognizes the syndromes vagatonia and sympatheticatonia, and the surgeon sees patients with altered motor activity of the stomach which resembles closely peptic ulcer, but when these patients are subjected to exploratory laparotomy, no evidence of ulcer nor of any disease of the stomach, duodenum, gall-bladder, appendix or colon is found. Such negative findings suggested some disturbance of the nervous mechanism and this led to the direct surgical attack of the nervous control. Bircher conceived the idea of removing the vagus influence by dividing its branches on the anterior and posterior walls of the stomach near the lesser curvature. He reported a series of twenty cases giving in each case the history, the results of gastric analysis and the x-ray findings before and after operation. In some of these cases, section of the vagus fibers was combined with other surgical procedures, such as resection, gastro-enterostomy and cholecystectomy. In eleven cases when enervation alone was done, a follow-up showed very favorable consequences. The noted post-operative effects included arrest of spasm, retention of motor functions to nearly normal and lowered acidity. As mentioned above the vagus branches contain anastomotic fibers from the sympathetic, consequently Bircher's operation was not entirely limited to the vagus.

Latarjet of Lyon made a study of the nerves of the stomach and devised a more anatomical method for gastric enervation. In his operation the three nerve pedicles already described are attacked separately by grasping the individual nerve branches and producing elongation and tearing by sudden traction. He does not cut the nerves of the lesser curvature, nor of the pylorus, but in most cases he ligates the right gastro-epiploic artery in order to divide those sympathetic filaments which he is not able to dissect as individual fibers. The purpose of the operation is to free the stomach from disturbing influences carried by the extrinsic nerves and to break the centrifugal path of reflexes when the initial source cannot be discovered. The effects of the operation have been to lower sensibility and acidity and to put the stomach at rest by reducing the intensity and frequency of the peristaltic contractions. He summarizes the indications for operation as follows:

"Gastric enervation is indicated in all cases of hyperkinetic stomach without visible macroscopic lesion accompanied by intense painful phenomena occurring in frequent or occasional crises, with or without hypersecretion, but more often with hyperchlorhydria."

This is the so-called gastropathy of the type vago-sympathetic. The operation has also been employed to relieve the gastric crises of tabes. In the presence of ulcer he believes that enervation may serve as an adjunct to classical surgical procedures, provided the patient suffers marked painful crises with considerable hypertonicity. He reports twelve cases with one failure. In this case enervation was combined with gastro-enterostomy. The patients were observed over a period varying from six months to two years. Six tabetics have been operated upon with one failure, one definite cure and four ameliorations.

Pauchet mentions twelve cases of enervation, some of which were combined with pyloroplasty. The immediate results were good, but he is not sure that they will be permanent.

Giannolla reports eight cases with favorable results. He has performed others in conjunction with radical procedures, but he does not report them because the same radical interventions alone have given identical results in other cases. He concludes that for all painful gastropathies with hypersecretion and hypertonicity, enervation has acquired the right to figure as the first plan of modern operative therapy.

Pannett (*British Medical Journal*, 10-1921, 558) reports a single case of a man aged 46, who had suffered for eighteen months with symptoms of pyloric obstruction. Gastric analysis showed hyperchlorhydria throughout digestion, and x-ray examination revealed a large stomach with an eight-hour residue. The patient failed to respond to medical treatment and was subjected to operation which showed no evidence of ulcer, nor of disease of the gall-bladder or appendix. A complete circumcision of the stomach with the exception of the region of the left gastro-epiploic artery was made near the cardia. Convalescence was smooth and the subjective symptoms were relieved. X-ray examination three weeks after operation showed a diminution in the size of the stomach, more rapid emptying time and no six-hour residue. Thomson reports complete recovery following left vagotony on a young man who had suffered many years from violent attacks of vomiting lasting two

or three days and recurring at intervals of from ten to fourteen days.

Schiassi employs a slightly different technic in operating for duodenal ulcer. He combines posterior gastro-enterostomy with enervation of the antral end of the stomach by a circular incision in the region of the antrum and a division of the pyloric pedicle. His experience includes eight cases of enervation, 15 cases of enterostomy with enervation and three cases of enervation on patients who had had a previous gastro-enterostomy with return of symptoms. He does not report the cases in detail, but states that after following them for a long time after operation, he is convinced that this operative procedure is the best which he has employed in the treatment of duodenal ulcer.

Of all the cases reported there has been no mortality. We have, then, an operation which is devoid of risk and simple to perform. It tiv benefited a class of patients that heretofore have not responded to surgical treatment in the hands of such capable gastro-intestinal surgeons as Pauchet, Latarjet and others. Whether the results will be permanent or whether in time there will be a high percentage of recurrences or the development of unfavorable consequences, such as gastric atony can be judged only from long experience.

Just what the field of usefulness of gastric enervation will be is the question which I wish to raise, but not to answer. The surgeon has been slow to attack the intricate sympathetic nervous system, but we have already developed such operations as peri-arterial sympathectomy for circulatory diseases of the extremities, extirpation of the superior cervical ganglion for relief of the painful attacks of angina pectoris and removal of the lumbar sympathetic ganglia for spastic paralysis. Can we add to this list another, an operation which does not attempt to replace classical surgical procedures, but which does seem to afford relief to a small group of patients that heretofore has not been relieved by medical treatment or surgical intervention?

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DISCUSSION (Abstract)

Dr. J. Shelton Horsley, Richmond, Va.—The operation suggested for interrupting the nerve supply in certain lesions of the stomach will have to be worked out further before it will have a satisfactory clinical standing. Much work has been recently done by the physiologists on the nerve supply of the stomach, and whereas it was formerly considered a settled question, it is now known to be anything but settled. Dr. Walter B. Cannon says that stimulation of the distal portion of the vagus nerve in a dog below the heart will cause either tonic contraction or relaxation of the pyloric portion of the stomach, even when the same current and the same electrode are used, with varying results depending upon the rapidity of the current.

Alvarez's work has attracted much attention. He thinks that most peristalsis is myogenic in origin, and that the extrinsic nerves have but little to do with the normal function of peristalsis. They, of course, have a certain general regulating effect and conduct long distance reflexes, according to his view. At least it seems certain that the old views regarding the vagus as a stimulator of the motor function of the stomach and intestines, and the sympathetic as inhibitory, have to be abandoned because doubtless both kinds of impulses come through both nerves. The vagus is a cable containing many different kinds of nerves, some sympathetic fibers among others. It is this uncertainty of accurate knowledge of the function of the extrinsic nerve supply to the stomach that would compel further observation upon a larger series of cases before the indications for an operation affecting the nerve supply to the stomach could be settled.

Dr. Devine, of Australia, has emphasized the importance of the sympathetic nerve supply in affections of the stomach and intestine. His work, based on that of Hunter and Royle, seems to show that there is often an imbalance between the sympathetic nerve supply and the motor supply that is supposed to go through the vagus, and that this imbalance often results in disease.

SURGICAL CARE OF THE TOXIC THYROID*

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In a study of the progress of thyroid surgery one is struck with the marked reduction in the operative mortality of the toxic cases. The present figures of 1 to 2 per cent are in striking contrast to the figures of ten years ago. While this reduction in the mortality following thyroid surgery is in part due to the improved technic of the modern operation, the greatest factor in making this low mortality possible is the proper pre-operative care and preparation of the patient and the adoption of suitable post-operative measures.

In considering the various factors which are of prime importance in the pre-operative preparation of the toxic thyroid case, we would first mention hospitalization and rest. If one compares the patient prepared at home with the one prepared in the hospital, the more rapid improvement in the latter case is strikingly evident. It is practically impossible for these patients to obtain at home the physical and mental relaxation which is an essential feature in the pre-operative care. At home the responsibilities of the household are always present, and though every effort may be made to abolish these burdens, they remain. Residence in the hospital takes the patient away from unfavorable influences and, though thoughts of them may continue for a while, many annoying details are eliminated.

As the energy requirement of goiter patients is well above normal as indicated by the increased metabolic rate, a high caloric diet and rest in bed are urged in order to build up the body weight. This is almost essential in those individuals in whom the weight loss has been great. Such cases may require rest in bed for several weeks before operative measures may be safely undertaken. If restlessness is marked, sedatives should be administered. It is our practice to use luminal for this purpose instead of the usual bromids, as the former is decidedly easier on the stomach. In certain cases opium in some form will be required. By rest alone, the metabolic rate can be reduced 10 to 15 points. Kessell, Lieb and Hyman[1] studied the effect of rest alone in 38 patients suffering with thyroid intoxication as determined by the symptoms and metabolic rates. These individuals were put into the hospital and kept under the most ideal conditions. No other treatment was given. The most striking thing noted in their series was the rather abrupt fall of the metabolic rate, this being in some instances as great as 20 points.

Kleinschmidt[2] advocates the use of quinin-hydrobromate not only as a pre-operative but also a post-operative measure. He finds that by the administration of this drug for several days the pulse is reduced 10 to 15 beats per minute, the restlessness is alleviated, body weight improved, and the patient becomes a much safer surgical risk. He has observed that the pulse is lower in patients who have taken the drug than in cases to whom it was not given. Furthermore, he is convinced that following its use there is decidedly less post-operative excitement. Frazier[3] states that he has had no results with hydrobromate of quinin, and Means and Aub have observed that rest plus hydrobromate of quinin had no more influence on the basal metabolic rate than rest alone.

During the hospital stay the patient is carefully examined both physically and with instruments of precision. The cardiac mechanism is studied and its action is compared during rest with the response to exertion, and its reserve strength estimated as well as possible. In many cases of thyro-toxicosis, and especially in that associated with adenomata, cardiac disorders are commonly found. We believe that the routine administration of digitalis is advisable in all cases. It acts as an anchor to windward in those who may have a tendency to marked post-operative tachycardia. In the arrhythmias, especially auricular fibrillation, it is positively indicated.

The renal function is also evaluated. Many goiters, usually adenomata, occur in elderly individuals who may have a certain amount of kidney damage not only as a result of age or previous affections but due also perhaps to impaired circulation resulting from a degenerating myocardium.

During the stay in the hospital there should be close contact between surgeon and patient. This not only permits the surgeon to obtain a better insight into the nervous control of the patient but permits the patient to become better acquainted with the surgeon. Such association gains the confidence of the patient and tends to lessen the fear of subsequent operation. In those who are markedly restless, or in whom the

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nervous control is greatly diminished, immediate operation should be deferred.

During the period of rest, estimations of the basal metabolism should be made. The value of these estimations are twofold. By such studies the psychoneurotics with goiters are differentiated from the true toxic thyroids. This perhaps is the greatest value of the study of basal metabolism. Not infrequently do we see types of mild intoxications or neurotic individuals who have all the symptoms of thyroid intoxication, even the enlarged gland, but in whom the metabolism is normal, or even subnormal. Operation upon patients of this character instead of improving them makes them worse.

A further value of the study of basal metabolism is the estimation of the then existing activity of the thyroid gland. Repeated metabolic studies gives us a fairly accurate index of the value of treatment, be it medical or surgical. On the other hand, the result of the metabolic study is of little value in the estimation of the individual's resistance to operative procedure. We have done thyroidectomies upon cases with a metabolism of more than 65 per cent without serious reaction, and again have seen very severe reactions follow thyroidectomy where the metabolism was less than 20 per cent above the normal.

Troel[4] in a study of 60 cases, 41 of which were operated, concludes that the basal metabolic rate is a reliable index of the activity of the thyroid gland. When the metabolism is more than 50 per cent above normal, operation is safe only when done in stages; above 80 to 90 per cent any operation is likely to prove fatal. Else and Irvine[5] state that there is no one method by which the resistance of the patient to surgery can be estimated. The basal metabolic rate and the clinical manifestations must both be considered. The basal metabolic rate indicates more accurately the activity of the gland, while the clinical manifestations indicate the resistance of the patient.

In 1881 McGuire[6] reported a case of exophthalmic goiter treated with iodin by the cataphoric method in which marked amelioration of symptoms was noted. Neisser[7] pointed out that small quantities of iodin are well borne by patients suffering with exophthalmic goiter and that great improvement may result.

In 1921 Loewy and Zondek[8] recall that it was the accepted view that iodin was contra-indicated in exophthalmic goiter. They showed, however, that the symptoms and general nutrition were improved by the administration of iodin and that by such treatment the pathological increased metabolism was reduced to normal. It was not, however, until Plummer[9] in 1923 advocated the use of iodin in the treatment of exophthalmic goiter that this drug became widely used.

Starr, Walcott, Segal and Means[10] studied most carefully the effect of iodin, given as Lugol's solution, in 42 cases of exophthalmic goiter. In more than 80 per cent an abrupt remission of the disease was noted, indicated by a fall in the basal metabolic and pulse rates, an increase in weight, and a diminution of other symptoms. In many cases the remission was as rapid and as marked as that following subtotal thyroidectomy. They further noted that continued use of iodin did not maintain this reduction in all patients leading normal lives. In some cases the recurrence of symptoms was rapid and the period during which the individual was free from symptoms was very short. Consequently, if operation is contemplated, it should be done promptly while the primary effect of the iodin is predominant. Because of the recurrence of symptoms during the administration of iodin, we do not believe that this drug is a cure for exophthalmic goiter, but rather that it is an additional means by which cases of severe intoxication may be brought to safe surgery.

We have seen one case in which following the long-continued use of iodin we were convinced that the goiter changed from a soft vascular type to one which was firm and finely granular. There was also an improvement in the general symptomatology. Whether the iodin alone was responsible for the change in the gross character of the gland we are unable to say. Since this experience, however, we have made it our custom to give the drug only for a week or 10 days immediately preceding the contemplated operation.

Should iodin be given as a pre-operative measure to the toxic adenoma? We see no reason why this should not be done so long as the period of administration is limited to a few days just before operation. Associated with a large number of adenomata one finds pathologically areas of hyperplasia resembling those noted in exophthalmic goiter. As a pre-operative measure, we have given iodin to a few cases of thyroid intoxication associated with adenomata and noted a prompt response to the drug so far as pulse rate, nervousness, etc., were concerned. We should emphasize the fact that iodin should not be given to adenomatous goiter cases where

there is no evidence of hyperthyroidism. To do so may inaugurate toxic symptoms.

Boothby[11] states that he has seen the hyperthyroidism of adenomatous goiter decrease and certain patients improve after the administration of iodin. In other cases, the result was an increase in the symptomatology, especially where the dose of iodin was large or long-continued. He suggests that iodin is principally concerned in the initiation of hyperthyroidism, and that afterward it may not greatly alter the course of the disease unless it is long-continued. He goes on to say that in those instances in which the differential diagnosis is not clear it is safe to give 10 minims of Lugol's solution two or three times a day for a week before operation and for a few days after operation. During this time no material harm can be done if the condition is adenomatous goiter with hyperthyroidism, and the iodin will protect against the post-operative exophthalmic crisis if the patient has coincident hyperplasia.

In presenting in this paper factors tending to lower the mortality of thyroid operations, it would not be amiss briefly to discuss anesthesia.

Local infiltration anesthesia without its added burden to the heart and kidneys is undoubtedly the ideal anesthetic. A primary requisite to the most satisfactory use of this type of anesthesia, whether in thyroid surgery or operations of other kinds, is the presence of a good "psycho-anesthetist" to calm the patient during the progress of the operation. Dunhill[12] states that where local anesthesia is used there must of necessity be more gentle handling of the tissues. He further states that it is not the general anesthetic *per se* which adds to the danger of the operation, but rather that by the rougher handling permissible under this type of anesthetic more secretion is thrown into the circulation and consequently the possibility of post-operative crisis is much greater.

In the substernal goiter where there is interference with respiration to such extent that the accessory muscles of respiration are used in breathing, a general anesthetic is contraindicated. General anesthesia paralyzes the spinal musculature, that is, the accessory muscles of respiration, and the movement of the diaphragm alone does not draw enough air into the lungs to supply a sufficient amount of oxygen to carry on the gaseous interchange necessary for life. Here, then, we have a positive indication for the use of local anesthesia, and it is only by its use that this type of case can be operated upon with a reasonable degree of safety.

In the high-strung patient local anesthesia alone cannot be satisfactorily employed. However, reinforced by the administration of nitrous-oxid-oxygen to the point where consciousness is obtunded and psychic stimulation eliminated, it is by far the most satisfactory of anesthetics, even for this type of patient. The recovery from gas-oxygen is rapid; it has no irritating effect upon the respiratory mucosa, and in the hands of a good anesthetist is practically devoid of danger.

By careful pre-operative management and the administration of iodin in proper instances many cases of marked thyroid intoxication may safely undergo primary partial or subtotal thyroidectomy. There remains a certain group, however, in which, regardless of the attention directed toward pre-operative care, primary thyroidectomy is unsafe. Such cases must be handled by carefully graded operations, beginning with ligation operations and gradually proceeding in successive steps to the removal of the gland. This group is made up largely of patients in whom the nervous manifestations of the disease are most evident. It is in this type especially that the anoci method of Crile has its greatest field of usefulness. Since the use of iodin as a preliminary measure in exophthalmic goiter, the size of this group has been materially reduced. In it will be found many individuals who become so excited while going to the operating room, or at times, even at the suggestion of approaching operation, that the pulse will increase to an alarming rate and the cardiac action become exceedingly bad. These cases can be successfully operated only by using Crile's method of "stealing the gland."

Of the operation itself, it is not our purpose to speak, nor does the scope of this paper permit us to discuss the character of surgery indicated under varying conditions. One point only would we mention, namely: that it is our custom in planning the operation to contrive to do a little less than we think the patient can stand.

Of the post-operative measures we have found that morphin, fluids in quantity and the ice pack when needed (this is rarely needed now) are our greatest assets. Of these, morphin is probably the most valuable. In bad cases we give this to the physiological limit, that is, until the effect is noted on the respiration rate. Fluids are given subcutaneously, even when there is no gastric upset following operation.

By the employment of the methods above outlined, we have in our last 100 cases reduced our mortality to 3 per cent.

In concluding we shall summarize as follows:

(1) Rest in the hospital is essential for the proper pre-operative care of the toxic thyroid, and by such treatment the condition of the patient is greatly improved. Hospitalization may be necessary from a few days to several weeks.

(2) During this period the heart and kidney function and the nervous stability of the patient should be carefully evaluated.

(3) The result of such observation combined with a study of the basal metabolic rate gives us a fairly accurate index of the severity of the intoxication.

(4) By the administration of iodin in some form severe cases may sooner be brought to a condition for safe operation.

(5) Local anesthesia reinforced with gas-oxygen is the best anesthetic for such cases.

(6) By the employment of the anoci method of Crile certain otherwise inoperable cases may be successfully operated.

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Discussion follows paper of Dr. Black, page 455.

GOITER: REPORT OF 235 CASES*

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Disorders of the thyroid gland may be congenital or acquired. Congenital goiter, which is extremely rare, may be present as a vascular, colloid, cystic or parenchymatous enlargement, the last mentioned type being the most frequent, and the cystic the least frequent. Vascular enlargement is not true goiter but occurs as a result of the long labor incident to face presentation (Skinner). If the parenchymatous enlargement is sufficient to induce pressure, the child may be dyspneic at birth, and should the enlargement not subside it may become necessary to divide the isthmus, or do a laryngeal intubation.

Acquired goitre is more frequent than congenital. Lues may reveal itself in the thyroid gland as a generalized enlargement during the early stage of the disease, or later as a true gumma.

Though there have been reported only about 30 true gummas, yet two of them occurred in children with congenital syphilis. A gumma in this region is difficult to differentiate from malignancy. If it is present as a mass in a patient with a strongly positive blood Wassermann, the therapeutic test should be tried.

Iodin is a constituent of the normal thyroid in all animals with the ductless gland. Its amount varies from 0.1 to 0.5 per cent, with an average of 0.2 per cent. Goiter is considered by some a deficiency disease. Simple goiter is easily preventable. The pregnant woman must supply iodin for the *fetus in utero* as well as for herself. Should her source of supply (food, water, drink) become impoverished, her gland automatically begins to enlarge. Thus it is that many goiterous women date the onset of their trouble to one or the other of their parturient periods. Any expectant mother developing parenchymatous enlargement of the thyroid should be given iodin at once. Many children born with too little iodin have fetal adenomata. in their gland. At least 90 per cent of thyroid malignancies are carcinomatous and 95 per cent of these develop from fetal adenomata. Fetal adenoma usually occurs as a solitary enlargement.

Cannon and Mix state that the adrenal is the whip to the thyroid; that it spurs the thyroid to greater activities during periods of emergency. Both these glands affect the pulse rate, the pulse pressure and the respiration. The adrenal also throws into the blood stream additional quantities of sugar, as Mix states, to enable the runner to increase his speed or the fighter his strength.

Davenport states that he removed the two eggs from a setting pigeon and the absence so perturbed her emotions that she was enabled to lay two more eggs in three days and to hatch them, whereas ordinarily she should not have laid again for three months. He was of the opinion that the centers of grief were so stimulated that it affected the adrenals to the extent of flooding her system with an abundance of sugar, and this, with the excitation of the

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thyroid, enabled the pigeon to perform this otherwise rather remarkable feat.

Over-activity of the thyroid causes its bearer to move with a sudden, quick, jerky motion. The sufferer is emotional, easily frightened and highly nervous. The heart sounds are sharpened, the pulse pressure is increased, tissue metabolism is hurried, and there is a flushing of the peripheral vessels. Should there be too little glandular secretion, cellular metabolism is delayed, the patient takes on weight, the skin becomes thick and firm, the hair dry and brittle, the mental apparatus lags, the patient becomes more and more of a recluse and often denies herself to family and friends alike.

Hyperthyroidism, if permitted to run its course, tends gradually to become worse and its characteristic symptoms progressively intensify. After the first six months many of these cases develop a crisis, and cardiac and visceral damage definitely takes place. From then on, the disease runs a wave-like course, alternating between better and worse. Each descension of the curve is longer and of greater severity than the previous one.

Certain mild hyperthyroid cases have been greatly improved by non-surgical treatment, but unfortunately the disease is liable to recur and a crisis may come to pass. If operation is resorted to primarily, this organ-wrecking process cannot take place. If there is a question as to whether or not the case is one of true hyperthyroidism, the patient should be placed in bed for a few days, and if the metabolic rate persists above normal it is practically certain that we are dealing with a toxic thyroid.

For hyperthyroidism, the pre-operative medical treatment, operative, and post-operative treatments are important. To our minds surgery is the surest and quickest way to cure a toxic goiter of a hyperplastic nature. Our pre-operative treatment is as follows:

(1) Rest in bed.

(2) Fluids by mouth, rectum or subcutaneously, 2,000 to 3,000 c.c. daily, especially if the patient is nauseated or vomiting.

(3) Morphin, hypodermatically, sufficient to quiet.

(4) Bromids, if the stomach will tolerate them.

(5) Digitalization.

(6) Lugol's solution (Mx to xx tid) by mouth or more by rectum for a few days prior to operation.

(7) Ligation of one or both sides of the gland if the patient is sufficiently toxic to prohibit primary thyroidectomy.

The administration of iodin prepares the patient for operation more quickly than other treatments that we have tried. Often the pulse rate drops, the nervous and mental symptoms subside and the gland itself decreases in size.

During the operation, should the patient show alarming symptoms, we seldom hesitate to stop and to dress the wound without suture. The operation can be finished later, and this open dressing permits free drainage of a highly toxic proteid material. After the operation, morphin is given in quantities sufficient to keep the patient quiet and hypodermoclysis is freely administered.

It should be remembered that in operating for exophthalmic goiter more glandular tissue can be taken with safety than with any other type of goiter. In fact, the more the better, as it lessens the likelihood of persistence or recurrence of symptoms. Of the 235 cases herein reported, 61 were toxic. Of these, 35 were cases of primary hyperthyroidism and 26 were cases of secondary hyperthyroidism. Two of the primary hyperthyroids had diabetes mellitus. They were especially prepared, then operated and went through to a normal convalescence.

All of the exophthalmic cases, except three, were ligated prior to operation. The amount of reaction following ligation is a real criterion of what that particular individual can stand. If the reaction is slight, in all probability the gland can be safely removed in a few days. If, however, on the other hand, it is marked with nausea and vomiting, it is better to tie off the other vessel after a few days and postpone the gland removal for six to eight weeks.

If the metabolic rate does not fall within range of the normal limits inside of six months after operation, hyperthyroidism persists and the surgical procedure has been inadequate. In practically all such cases there will be present one or more of the clinical symptoms of the disease and more of the gland should be removed.

One of our cases died in a crisis on the second day after ligation. A second case was lost, but her death apparently was embolic and in no wise reactionary, as she had been in good condition just before the nurse found her gasping for breath.

Of the 26 cases of secondary hyperthyroidism, 24 were operated. None of these had glycosuria. With one exception, all were operated upon in

one stage. Two died with high fever, vomiting, a running pulse and a wild delirium on the second and third day, respectively, following operation. As we see them now, neither of these cases should have been operated. They were among our earlier cases.

Adenoma cases or cyst adenoma with an advanced toxic symptomatology constitute, in our opinion, the gravest risk of all goiter patients. These 26 cases were all in women who averaged 47 years of age, and who had had their goiters from 7 to 28 years before the advent of toxic symptoms.

Basal metabolic readings should be made of these cases, as well as of the true exophthalmics. Often they are surprisingly high, and when taken into consideration with the other findings they serve as an index as to whether the patient should be further treated, ligated or operated, in single or multiple stages.

Three of these cases were partly intrathoracic, though none of them were wholly so.

Excepting the 61 toxic cases, the other 174 patients were all non-toxic and of them the great majority (91 per cent) were adenomata, with or without colloid and cystic degeneration. Four of this group were partly within the thorax. Over 75 per cent were multiple. Two of these colloid adenomata were so large that one was done in two stages and the other in three stages.

The three-stage case manifested some toxic symptoms, and the gland covered her neck from ear to ear, and from the chin it extended downward, hanging over the sternum. Under combined anesthesia, first the right lobe, then the isthmus, and finally the left lobe were removed. The patient made an easy recovery.

Multiple operation makes the procedure a safer one. It lessens the loss of blood, reduces the amount of raw surface, minimizes shock and turns an otherwise risky procedure into a comparatively safe one. The colloid, it should be remembered, is the type of goiter which often produces a large gland with but slight toxicity.

Of our last 131 consecutive operated cases, 80 per cent were done under novocain infiltration, or novocain combined with mild narcosis. The remaining 20 per cent were done under ether. Myxedema did not follow in any of the operated cases. In five of the non-toxic cases we gave thyroid extract or syrup of ferrous iodid for several days following operation, for fear that too much tissue had been taken. Subsequent examination, however, and basal metabolic study failed to show any of the signs or symptoms of that disease.

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DISCUSSION (Abstract)

Papers of Dr. Frank and Dr. Black

Dr. Irvin Abell, Louisville, Ky.—Those of us who have lived through the development of these factors of safety described by the essayists are extremely grateful for them, since they have reduced the mortality from one that tested the fortitude of the bravest to one that is within reasonably safe limits.

A trained personnel is at all times essential to the good work of the surgeon. In the treatment of toxic goiter it is absolutely imperative. A highly differentiated knowledge based upon the chemical and metabolic changes dependent upon the excessive thyroid secretion is absolutely essential for their successful management.

The various measures mentioned by the essayist have been employed by me with the exception of stealing the gland in toxic cases. We have endeavored to train our personnel so that such cases come under the care of especially proficient nurses. With their cooperation we endeavor to encourage the patient in the belief that the removal of the goiter is to be the means of a restoration to health, so that the patient approaches the operation with a confident hope of recovering health. The operability of such patients cannot be determined by the metabolic rate alone. This indicates the toxicity present and is but one of the factors which indicates the patients' ability to withstand resection. The pulse rate, the gain in weight, the subsidence of nervous phenomena, the testing of the reserve power of the heart, the presence or absence of myocardial or renal degeneration with or without compensation have to be considered. No little degree of surgical judgment is required to evaluate them correctly. The one who is able to estimate accurately the patient's resistance is the one who secures the lowest mortality.

Formerly in our work we used the x-ray with or without ligation as a means of reducing toxicity preliminary to resection. Since the introduction of the employment of iodin in the preparation of toxic goiters for operation, the x-ray has been discontinued and the use of ligations has been notably decreased. We now do one where we did 10 to 12 formerly. Lugol's solution is the preparation which we have used, and we have given it in such dosage as the toxicity would indicate to be desirable, from 30 to 90 minims daily. In some instances we have found iodin to produce such disturbance of the stomach or such skin irritation as to render its use inadvisable. Some patients seem to possess a marked idiosyncrasy to it.

The choice of the anesthetic is determined by the type of goiter and condition of the patient. In nontoxic adenomata any anesthetic, gas, ether or local, is satisfactory. In adenomata with marked myocardial degeneration and in adenomata of the substernal type

local anesthesia alone is preferable. In the hyperplastic toxic types analgesia with the additional employment of local anesthesia has, as indicated by the essayist, given the best results.

Since the cause of thyroid hyperplasia with toxicity is unknown, we are unable to approach the problem from an etiological standpoint, but must be content with a reduction of the thyroid secretion by means of resecting the hyperplastic tissue. Variations in the amount of tissue resected in some instances, and a continuation of the activating cause in others are responsible for a certain percentage of incomplete results and recurrences. In our experience these have varied from 3 to 5 per cent; at least this percentage has returned to our clinic. It is possible that the percentage would be higher if we knew of those who had sought relief at other hands. Some of these have required a second operation, while others have been completely relieved by appropriate x-ray therapy.

Dr. J. Shelton Horsley, Richmond, Va.—I wish to mention the use of ethylene, particularly in toxic goiter. It seems to us to be better than nitrous oxid, as there is not such a marked tendency to cyanosis. In toxic cases, however, we follow the technic of Crile, and use local anesthesia or novocain in addition to a light general anesthetic.

The second point is the advantage of the intravenous injection of glucose solution in toxic goiter cases. This can be given more or less continuously, according to the general principles laid down by Matas, of New Orleans. The continuous instillation of glucose solution in the vein is a valuable remedy in many conditions, and in toxic goiter it seems to provide the glucose which acts as a buffer for the tissues in hyperthyroidism, and furnishes the fuel for the excessive metabolism to burn instead of attacking the tissues themselves. We use 5 or 10 per cent glucose solution in freshly distilled water, or in Ringer's solution made up of freshly distilled water, and employ a long slender glass container such as was formerly used in the administration of 606, so that the rate of flow may be measured more or less accurately. In great urgency, of course, the flow can go in more rapidly, but usually it can be regulated so that 150 or 200 c.c. of glucose and Ringer's solution enters the vein every hour. Whereas, insulin is used after every 500 c.c. are entered when glucose is used in shock and hemorrhage, it is usually unnecessary to introduce insulin in hyperthyroidism, though if the blood sugar is high it will do no particular harm. By this remedy, in connection with ice-caps and morphin, the post-operative reactions of hyperthyroid cases can be largely controlled. The solution can be given continuously for several days if necessary.

Dr. Francis Reder, St. Louis, Mo.—The thyroid gland has been called the balance wheel of nutrition. Without a normal activity of the cells, an impaired state of health must exist. Classification of their activities is based on the effect upon metabolism. The thyroid is classed as catabolic, because it accelerates body processes. This is easily shown, because its hyperfunction in goiter gives excitability and tachycardia.

Symptoms of disease of the thyroid are produced either through the nerves or the internal secretions. In the thyroid the changes in cellular structure constitute the pathological anatomy of the disease, while the changes in their function constitute the pathological physiology.

Goitrous enlargements associated with a well defined thyrotoxicosis present to us the most perplexing problems for treatment.

It is the proper and timely operation that so far has been the encouraging factor in the saving of lives. It is good judgment to remove without delay a goiter showing toxic symptoms, even though they appear somewhat indefinite. I should regard it as dangerous practice to wait for so-called cardinal symptoms of hyperthyroidism to establish themselves.

An unexplained tachycardia should always be looked upon with suspicion. Extremely bad surgical risks are cases of toxic goiter in pregnant women. A violent thyrotoxicosis may at almost any time develop in a pregnant woman who may have had an innocent goiter for years. Such a goiter will sometimes become spontaneously cured toward the end of pregnancy, or cause the death of the woman.

Pregnant women with toxic goiters usually miscarry. Many become seriously sick and some die. It is a very alarming condition with and without operation. My advice to a woman in the child-bearing age who is the possessor of a simple goiter would be to have the goiter removed surgically.

TETANUS*

By J. M. Poer, M.D.,
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Tetanus is an acute infectious disease caused by a specific bacillus with an incubation period of 3 to 60 days. The disease is characterized by violent tonic spasms of muscles which under various stimuli may become clonic in nature.

In 1884 Carle and Rattone first proved its infectious nature by reproducing the disease in animals after inoculating them with pus from the site of infected human wounds. In 1885 Nicolaier discovered that there was a bacillus widely disseminated in top soil, which, when inoculated into animals, produced the disease. Rosenback followed these experiments with proof that these bacilli which Nicolaier had found in top soil were the same bacilli which were found in men having tetanus. In 1889 Kitasato grew them in pure culture and showed that the cultures would reproduce the disease. He proved it to be an anaerobic organism. The bacillus develops best at body temperature. Low temperature inhibits its growth. Its spores can resist a temperature high enough to destroy all other germs, and it retains its virulent qualities. After becoming dry in air, it may retain its power to sporulate over a long period. Its spores may remain dormant in tissues at the site of original entrance for days and weeks. If other bacteria or aerobic

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organisms are active, even at a later date, using up oxygen and causing tissue necrosis, then the tetanus bacilli become active. They do not disseminate through the tissues as other infections do, but are found and remain only in pus at the site of original infections so that the successive involvement of muscle groups is not attributable to the rapid dissemination of the bacilli but rather to the effect of their toxins. These toxins are taken up by fluids of the body and can produce fatal results, even though the original tissues infected are entirely extirpated at an early date.

Breiger isolated these toxins and called them tetanin, tetano-toxin, spasmo-toxin and hydrochloro-toxin, which in small doses administered to animals reproduce the typical convulsions. The toxins have a high degree of special affinity for the central nervous system. Erlich demonstrated that there was also in the nerve a substance seeming to have a special affinity for the tetanus toxin. Jacob, of Berlin, gives this the name of tetanoid substance. He showed that it traveled along the perineural lymphatics, not by capillaries, and that it traveled along the axons of nerves centripetally and not toward the extremities. The toxins are soon distributed to the blood current and all tissues of the body. Hence it is necessary early and continuously to keep body tissues and lymph streams saturated with as high concentration as possible of antitoxins.

In experiments on animals the incubation period is 24 hours. The region of the body immediately adjacent to the area of inoculation begins to contract first and then the tonic and clonic spasms spread to the entire muscular system. Death ensues in three or four days.

In 1909 Matas, of New Orleans, demonstrated that the bacilli were present in the feces of men and horses and that all highly cultivated soil where stable manure had been freely used was most polluted; that men who had eaten raw vegetables, such as radishes, lettuce, onions, celery, etc., carried the bacilli in their feces, and he issued timely warning that no elective operations should be done upon such patients until several days had elapsed without their having eaten raw vegetables.

In all emergency surgery, especially abdominal sections, an immunizing dose of antitoxin should be given. The presence of tetanus bacilli in the feces might account for some post-operative tetanus, in the past unexplained, or charged to suture material. Since soil pollution of wounds is the source of all tetanus, all wounds should be looked upon as potential cases, but the fact that so few really develop symptoms may be due to the anaerobic nature of the bacilli. Many injuries and infections are superficial or open and exposed to air. But the bacillus is found in penetrating injuries such as are produced by splinters from dirty floors thrust deep into tissues, where the bacilli find suitable conditions for colonization and the development of their deadly toxins. All cases may be classed as traumatic, even the post-puerperal and umbilical infections of the new-born.

DIFFERENTIAL DIAGNOSIS

If we should be so fortunate as to have the case under observation at its onset, we should class the disease as first local and then general, just as has been described, with experimental cases in animals. The muscles nearest the point of infection are the first involved, and the superficial and deep reflexes are increased early in the infected extremity. Touching the infected foot or hand will throw the affected limb into tetany, others remaining relaxed. Babinski's reflex ankle and patella clonus are at first local, and there is a general increase to nervous irritability to mechanical stimuli. The greatest tragedy in all medicine is that the medical men see these cases only after all symptoms have developed and much time has elapsed from the primary lesion, when only amateur care has been given or none at all, and, of course, no prophylactic serum has been used. The onset may be gradual or violent. It is always local and then general. There are pains in a local area and spasms of muscles in the infected region and intense spasms and painful contracture of definite muscle groups involving the neck and jaws. There are pains in the jaw, and articulation is increased by movement of the jaw. The muscles of the face and neck become spastic; there is pain and difficulty in swallowing, and within 24 hours from the onset the jaws may be locked. The onset is accompanied by insomnia, starting at noises, bright lights and sudden draughts. Gradually the entire system becomes involved, including the chest, diaphragm and abdomen. General tonic spasms prevail, clonic convulsions are precipitated by efforts of the nurse or physician to administer nourishment or medical aid, and the patient is in eminent danger of early death by asphyxiation, acute dilatation of the heart or exhaustion. The organs of the body and mind and special senses seem not to be affected by the disease. High temperature may persist throughout the disease, and its degree helps in giving some idea of progress. Afebrile

cases offer a more hopeful outlook than febrile ones. The pulse is usually rapid, sweating is profuse, 105° temperature is considered grave and in its presence recovery is doubtful. Urine is scant. These symptoms rarely need a differential diagnosis. It is well always to keep in mind strychnin poisoning, tetany and hydrophobia, meningitis and hysteria.

PROPHYLAXIS AND TREATMENT

Prevention is the watchword of the hour. Could a competent physician see every injury, we still should have some tetanus, for unfortunately, on account of expense and the lack of education of the public, many cases may go without prophylactic serum. For no reason should a physician neglect to give the prophylactic dose or doses where the nature of the injury and possible infection of the wound make it strongly probable that the tetanus bacillus has been carried into the injured tissues. A grave responsibility rests upon the surgeon, for he is fully aware of the ubiquitous nature of the germ and should for his own safety, as well as that of his patient, use 500 to 1,500 units, according to age in every injury, grave or trivial. There should be provision for this supply of serum by our railroad authorities and health boards. The army took no chances along this line and set the example of ordering all injuries, serious or slight, to receive a prophylactic dose at the first-aid station and another at the base hospital. As the power of this serum lasts only 8 to 10 days, it should be repeated every seven days until the original area of infection is well. On account of the possibility that the bacillus may lie dormant for some time and then flare up, antitoxin should be continued every seven days as one's judgment may dictate.

In all penetrating wounds with pen, splinters, nails, gunshot wounds and all powder burns, blank cartridges, paper cap pistol burns, Fourth of July injuries and all injuries about stock yards, barns, cattle cars, compound fractures and in all emergency surgery, especially of the abdomen where the patient has recently eaten raw vegetables or berries, the prophylactic serum is imperative. Plastic surgeons advise it in all cases before reopening scar tissues where the original infection was of such nature as to suggest the possibility of a tetanus infection. More patients have been saved by prophylactic serum than have been cured by serum therapy. Prophylaxis may also include proper care of the original infected wound which should be similar in preliminary treatment to that which becomes imperative when tetanus has been diagnosed, that is: incise freely, open to the air, remove foreign material, clean with carbolic acid and alcohol or iodin and alcohol, mercurochrome, wet alcoholic or boric acid dressings, and use hot peroxid freely in the open wounds. If these measures are used early with prophylactic serum, the toxins will not form, or if they form they will be delayed and late, and mild symptoms will appear, creating a favorable prognosis for the disease. Treatment may be classed as local, just described, as serum therapy to antidote the toxin already in the system and producing symptoms, medical therapy, nursing and diet. As toxins travel along the axons of nerves proximal to the original infected area, the first injection of antitoxin should be along the axis of such nerve, following the technic of local anesthetists. If the wound is on the hand, the brachial plexus may be used; on the foot, the crural or sciatic. All treatments must be heroic, and constant, until the disease terminates by death or recovery. The antitoxin has been shown to be harmless and massive doses should be given: first, intramuscular along the nerve track, which is absorbed in 24 hours; subcutaneous, which is absorbed in 48 hours; intravenous and intraspinous. The head should be lowered after the serum is given. In the intraspinous administration 20 c.c. of fluid is first withdrawn. Caution should be issued always to have a syringe loaded with adrenalin solution, for when it is indicated it is needed badly and promptly. In full treatment, 135,000 to 200,000 units have been given to one case; 30,000 to 40,000 a day, or even 60,000 to 70,000 a day, divided into different methods as above described. The entire treatment may last four or six weeks. Treatment should be repeated every day until the symptoms subside, and then every three or four days to termination. Intraspinous methods seem to have given the best per cent of recoveries. However, for many reasons the intravenous is the method of preference. Bloodgood and McShannon recommend that it be given by intra-ventricular injections. Freidlander reports two cases treated successfully by the intravenous methods exclusively, giving 10,000 to 20,000 units several times a day until the spasms were gone. In one of his cases the total serum used was 213,000 units over a period of 28 days and the other 755,000 units in 24 days.

All surgeons agree now upon massive doses and persistent usage of serum. Sulphate of magnesia, 1 c.c. of 25 per cent sterile solution to each 20 pounds of body weight given intraspinously has controlled spasms for 24 hours,

and some clinicians recommend it. However, it is not without its dangerous possibilities.

In 1888 Bacilli, an Italian scientist, discovered that injection of a solution of carbolic acid was followed by a marked diminution of reflex excitability of the nervous system. He used it successfully in his practice. Kocher recommends that it be given in doses of 15 minim of 3 per cent solution every two or three hours. Ascoli reports having injected 72 c.c. daily after this manner and by intra-muscular route for 10 days and 60 c.c. per day for 41 days without getting cloudy urine or any untoward effects.

Dr. Willis Jones reports several cases treated successfully by this method at the Georgia Baptist Hospital, Atlanta, Ga. The interns at Grady Hospital, Atlanta, tell me they are using it with success on some of their cases. Cloudy urine seems to be the warning to suspend this treatment. It seems to me it would be good treatment in muscles proximal to the area infected. It would thus block the progress of toxins to the central nerve centers and serum therapy could be used intravenously and intraspinously with carbolic treatment to antidote the toxins already absorbed.

Medical therapy in these cases revises the teachings of materia medica as to dosage. The symptoms are the chief guide to the quantity of any drug to be used. Morphin, chloral, bromid, luminal, and chloretone, all have their places, and it is for the surgeon to make his choice as to remedy and dosage.

Ether anesthesia must frequently be resorted to in the administration of the serum. Sterile salines must be used freely by the intravenous and Murphy drip methods.

The scope of this paper will not permit a description of drug medication, of methods of feeding patients by duodenal or stomach tube or drop method by rectum; of quantity and method of administering fluids, or any full description of hydrotherapy and hot baths, or nursing rules which should include a quiet dark room, exclusion of visitors, proper bedding and general handling of the patient. All these are questions for individual surgeons to solve.

After all the methods and skill and ingenuity of surgeons have been used, the mortality rate is still very high, about 35 per cent at best. In acute cases occurring in 3 to 10 days, the mortality is 95 per cent. After the eleventh, it is 65 per cent. In subacute cases from the first to the tenth day, it is 50 per cent. After the eleventh, it is 25 per cent. The longer the incubation period the better the prognosis. It is such a deadly and treacherous disease that it is unwise in any case ever to make a favorable prognosis. Interpretation of war records is different, because prophylaxis was universal.

Since no one surgeon sees enough of these cases in a lifetime to draw any worth while scientific conclusion as to the real merits of any one method of treatment, it seems to me that the best step to standardize our knowledge of this disease is to require a universal and definite report of all cases to county and state boards of health, and to give complete data in all cases. The questions should be, for instance: Did you treat the primary lesion? Describe the character of the lesion and the local treatment given. How soon after primary infection did you see the case? Was prophylactic serum given? What size dose, how many and how frequently were they administered? Was the case first observed as fully developed tetanus? What treatment was used and how was it given? Give the result of the treatment or termination of the case.

In this manner statisticians could soon give us a fairly scientific conclusion as to best methods to use in any given case, whether mild or severe, whether cases have been neglected or treated properly from incipiency, and whether given prophylactic serum or not.

This would mean real progress in a most fatal disease and bring together data otherwise unobtainable.

DISCUSSION (Abstract)

Dr. J. R. Garner, Atlanta, Ga.—While tetanus is a very dangerous form of infection, my experience of more than 20 years in railroad surgery has convinced me that it is rare in our particular line of work. The germ is one that grows and lives in garden mould and animal and human excreta. One would suppose that the right-of-way of a railroad wound naturally be heavily infected owing to the frequent passage of trains from which toilets empty directly upon the roadbed; but this very roadbed is constantly being worked, the ballast exposed to the action of the atmosphere, and as the germ is anaerobic, it is killed by the action of the air before it has had the opportunity of multiplication to any great extent. For these reasons I believe we seldom see tetanus in railroad accidents and injuries. When the disease is encountered in this class of cases, it is generally to be found in car repairers who have been engaged in work upon stock cars, or cars in which stock, manure or fertilizer have been shipped, and who receive injuries while performing these repairs. The proposition of giving tetanus antitoxin in cases of injuries received while engaged in railroad work should be determined largely by the local surgeon handling each individual case. After a puncture wound, it might be well enough to administer a prophylactic dose, but for an open wound it is unnecessary. However, it is my opinion that all chief surgeons will gladly approve and pay for any tetanus

antitoxin the local surgeon may use in a prophylactic way. I shall never decline to approve such a bill on any of my lines.

In treatment I have had no personal experience. I have been in close touch with the work being done by Dr. J. M. Wainwright, of Scranton, Pa., who insists that the administration of large doses of antitoxin intravenously and immediately upon diagnosis of the disease will markedly reduce the mortality. He states that intraspinal injections are not only not beneficial but are very harmful and increase the mortality. His intravenous doses are from 30,000 to 50,000 units and are repeated for one or two days if needed. His reports show a reduction in mortality to something like 32 per cent. It will be well to keep Dr. Wainwright's work under observation, for he appears to be obtaining better results than anyone else at present.

THE APPLICATION OF MODERN UROLOGIC DIAGNOSTIC METHODS IN PEDIATRICS: CASE REPORTS*†

By HAMILTON W. MCKAY, B.S., M.D., F.A.C.S., Charlotte, N. C.

In presenting this subject it is my earnest desire to stimulate more interest among urologists in a subject, which upon investigation, appears practically an undeveloped province of medicine and surgery. Your attention is directed to the small number of men in this country who have made a study of the subject. Kretschmer,[1] Beer,[2] Hyman,[3] Hinman,[4] Stevens,[5] Thomas and Tanner,[6] and Helmholz[7] have been pioneers in this field and a close study of their efforts has been an inspiration in my work in this field. A careful urological study of the adult presenting genito-urinary symptoms is now recognized as a necessity by all surgeons who desire to give their patients an intelligent opinion. Such a study may require cystoscopy, ureteral catheterization, functional kidney determinations, cystography and uretero-pyelography. These are all well known procedures and are considered necessary in arriving at a correct diagnosis in the adult. Are not these same valuable instruments of precision and modern urologic methods both applicable and practical in urologic studies of pediatric cases? Why do children, presenting genito-urinary symptoms, not receive the same careful urologic studies as do the "grown ups?"

*From the Crowell Clinic of Urology and Dermatology.

†Read in Section on Urology, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

Coordination of Efforts of the General Practitioner and Pediatrician With Those of the Genitro-Urinary Surgeon.—The family physician and the pediatrician first see practically all children presenting urinary symptoms. Hence, it is evident that we must secure their closest cooperation to achieve results. It is necessary for the urologist to demonstrate to the general practitioner and pediatrician that the use of the cystoscope and other modern urologic methods of diagnosis is simple, safe, sane, and often necessary for a diagnosis in children, just as they are for adults. The pathologic conditions of the urinary tract in children differ in no respect from the genito-urinary lesions found in the adult except as age influences the incidence of malignancy in such cases.

Incidence.—Probably diseases of the genito-urinary tract are less frequent in children than in adults, but possibly they occur much more frequently than they are diagnosed. Drs. Brown and Corbeille[8] in a study of eighty fetuses and young infants have shown that sixty-three, if they had lived, would have started life with impaired renal function. The material upon which their studies were made was not

Fig. I, Case 1.
Probe in opening of extra ureter in wall of urethra, child 8 years old.

Fig. II, Case 1.
Ordinary probe passed gently up extra ureter, child 8 years old.

selected, but taken at random and their pathologic findings would indicate that genito-urinary diseases exist more frequently in children than they are disgnosed.

Symptoms Requiring Thorough Urologic Investigation.—Subjective symptoms referable to the urinary tract are difficult to elicit in childhood and much more difficult to interpret. Objective symptoms are: (1) Pus in the urine (from catheterized specimen); (2) enuresis; (3) overdistended bladder; (4) abdominal tumors thought to be of urinary tract origin; (5) localized pain in the kidney and bladder region, (6) rarely hematuria. The above are some of the common conditions which are frequently encountered in diseases of infancy and childhood, and all require thorough urologic study.

Cystoscopy in Young Boys.—Very small instruments are now available for cystoscopy and ureteral catheterization, but for anatomic reasons, this work is somewhat limited and difficult in young boys. Meatotomy and internal urethrotomy may be indicated in cases with small meati and abnormally small urethrae. In baby girls little trouble is encountered in carrying out the routine urologic examination.

Indications and Necessity for Cystoscopy in Pediatrics Not Emphasized.—In young children giving evidence of a possible beginning acute otitis media or an acute meningitis, the general practitioner and pediatrician in attendance do not hesitate to advise an anesthetic to the point of analgesia for the purpose of either a thorough examination or incision of the ear drum, or lumbar puncture as a diagnostic or therapeutic measure. The bronchoscope is recognized as a very necessary instrument of precision and the bronchoscopist's work is not only necessary, but outstanding in every community. Removal of a foreign body from the respiratory tract of a year-old child is quite common, while cystoscopy and ureteral catheterization advised on a child of the same age is generally looked upon with doubtful value and fraught with many dangers. The answer is quite evident. The bronchoscopist has properly presented the value of his work in children to the profession. The urologist has not.

Urologic Procedures Adaptable to Young Children.—Routine cystoscopic and roentgen ray examination should be made in children with persistent urinary symptoms, keeping in mind lesions of the upper urinary tract and the

Fig. III, Case 1.
Uretero-pyelogram showing outline of extra ureter, tip of probe back of bladder wall. child 8 years old.

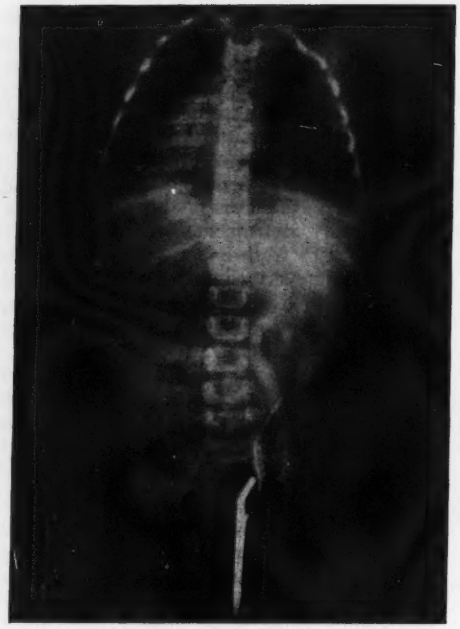

Fig. IV, Case 6.
Showing dilated ureter in a child of 2½ years. Chronic recurrent pyelitis.

presence of calculi that cannot be shown by the roentgen ray. Cystography is most important in cases of marked pyuria, where it is difficult to clear the bladder fluid in order to use the cystoscope, and Hyman[3] prefers this measure to cystoscopy in children. It is a simple procedure and can be carried out in the very young without anesthesia. In cases of diverticula Hyman[3] recommends contrast cystography. A plain cystogram is taken, after which the solution is drained off. Air is then injected into the bladder and another plate taken. In the contrast cystogram the air-filled bladder stands out in contrast to the diverticula which still contains the cystographic solution. Pyelograms and ureterograms should not be made unless there is some definite indication, since the child is usually asleep and it is difficult to tell when the ureter and kidney pelvis are completely filled. It has been our experience that with the use of Todd's pressure gauge, satisfactory pyelograms can be obtained with a minimum amount of danger to the patient, followed by little reaction. One baby in whose case the pressure was not controlled, had a rather severe reaction which subsided in 24 hours. In this connection we have also observed, in our somewhat limited experience, that children seem to stand ureteral catheterization better than adults. These cases we report have apparently had little trouble or discomfort except in the one case mentioned above. It has occurred to us that with complete relaxation of the ureter under ether, instrumentation can be done with less irritation to the mucous membrane of the ureter and therefore less ureteral spasm and pain following. Litholopaxy has been successfully practiced in China, India and Russia, and Freyer in England reports 140 litholopaxies in children.

Kretschmer reports two cases of vesical stones in children in which he employed the crushing operation.

Persistent Relapsing Pyelitis in Children.—We are frequently consulted as to the treatment in a group of pyelitis or pyelonephritis cases which have persistently resisted all the routine therapeutic measures generally employed. The proper management of such a group of cases constitutes an important problem for the pediatrician who more and more will consult the urologist. Here, the importance of careful urologic study should again be emphasized. Pus in the urine (from a catheterized specimen) is too often considered diagnostic of a pyelitis. Especially is this true in boys where mechanical obstruction and diverticula have to be considered or excluded. Persistent pyuria (catheterized specimen) then should be a very definite indication for thorough urological investigation. Colon bacillus pyelitis is the most frequently encountered pathological lesion found in the upper urinary tract in children. Pelvic lavage should have a very definite place in the management of resistant cases of pyelitis and pyelonephritis. We believe it is a safe and easily carried out procedure which gives as good results in children as it does in adults.

The following cases form a preliminary report of what can be accomplished by a thorough urologic study and treatment of young children who present various urinary symptoms.

Case 1.—A girl, eight years old, was admitted to our clinic Dec. 1, 1923. The chief complaint was dribbling of urine. The father had died of cancer of the liver at the age of 39. The mother was living and well. The past medical history was of no significance. The child had never had a severe illness, but had had constant dribbling of urine since birth. She was a well developed, well nourished and healthy looking child. The lungs were clear throughout. The heart was regular, no murmurs. The abdomen was negative, and the external genitalia were negative.

Fig. V, Case 7.
Normal pyelogram, child 2 years old. Chronic pyelitis.

On careful examination there was a small opening on the right lateral wall of the urethra from which could be seen intermittent spurts of urine. The action resembled that of a ureteral opening in every respect except that it was smaller. There was both an intermittent and expulsive muscular action, which caused the urine to spurt intermittent'y, simulating the appearance of a ureteral opening when seen with the cystoscope in the bladder.

Under cocain anesthesia an ordinary probe was passed gently into this opening and far enough upward without meeting resistance to indicate that it had passed beyond the bladder wall. The patient was cystoscoped without difficulty. At the same time a probe was passed up the extra opening, the end of which was back of the bladder wall. A pyelogram was done on her left side with the idea that the pyelographic media might flow through the extra ureter. This did occur.

There was an anomalous ureter opening on the right margin of the external urinary meatus near the position of Skene's duct. An unsuccessful attempt was made completely to obliterate this tract between the external meatus and the bladder by passing a probe through the sinus and ligating it by separating the superficial vaginal wall. Later, an effort will be made to isolate the anomalous ureter and remove it.

Case 2.—A girl, eight years old, was admitted to our clinic March 5, 1925. The chief complaint was pyuria and pain in the region of the left kidney and loin (unreferred).

The child had always been frail and delicate and had had indefinite gastric symptoms all of her life. The tonsils and adenoids were removed four years previously. She suffered with an acute attack of pain in her left lumbar region about three years previously; the pain referred to was groin and accompanied by frequency of urination and fever. Pus was reported in the urine at this time. At intervals she had had similar attacks which were accompanied with frequency of urination and temperature. The last attack came on a month ago and was more severe than the others. The temperature ranged from 102 to 103° F. for a week or ten days. There was considerable blood in the urine at this time.

The general appearance of the patient was that of a delicate young girl. There was nothing remarkable noted on superficial examination. The external genitalia were negative. There was no difficulty in passing the cystoscope. The bladder was negative throughout. Both ureters were normal in location and appearance, and were catheterized without difficulty. The urine was entirely negative from a catheterized bladder specimen and from each kidney individually. The culture of urine from each kidney was negative. Upon examination no stone shadows were seen. The left pyelogram showed a normal pelvis, with no enlargement or dilatation.

Laboratory Findings.—There were 9,200 white blood cells, 4,300,000 red blood cells and 85 per cent hemoglobin. The blood Wassermann was negative. The patient was ordered to report back on the twelfth and as the history indicated recurrent pyelitis, it was thought advisable to do a uretero-pyelogram, which showed a normal pelvis. The genito-urinary tract was apparently negative. No treatment recommended observation.

Case 3.—A girl, six year old, was admitted to our clinic July 6, 1925. The chief complaint was incontinence of urine since the age of two years. The family history was negative. She had had the ordinary diseases of childhood with no complications. She was a well girl until two years of age. She then had intermittent attacks of pain in the lower hypogastric region and attacks of fever. During the six weeks before admission she had lost considerably in weight and for the preceding two weeks it had been necessary for the family physician to catheterize her at intervals.

Cystoscopic examination showed marked relaxation of the vesical sphincter. There was no difficulty in passing the cystoscope. The bladder was markedly inflamed (second degree cystitis). It was quite difficult to distinguish the ureteral openings. The right ureteral opening was finally located and catheterized, and was about three times the normal size. We could not locate the left ureteral opening. The trigone and vesical neck were smooth and gave the appearance of being "ironed out."

X-ray.—The first cystogram was made July 10, 1925. The outline of the bladder was rough on both sides, but smooth at the base. There was a very definite displacement of the bladder to the left side and an indentation in the upper right portion of the bladder shadow suggested the presence of an external mass in the right side of the pelvis. In a second cystogram under greater pressure, the filling part of the irregularities of the bladder outline were smoothed out and the left ureter showed a regurgitation to the kidney.

Fig. VI, Case 10.
Stone in lower third of left ureter, child 6 years old. Stone recovered.

The ureter was dilated and showed a sharp kink in its mid-portion. The displacement of the bladder to the left was still pronounced and the filling defect in the upper right was present.

The patient was re-cystoscoped July 11, under ether and a right pyelogram was done. The pyelographic medium did not fill the kidney pelvis at all, but came back into the ureter, showing that the right ureter was markedly dilated throughout its length. In a cystogram the bladder was only partially filled with a rough outline and defect on the upper right side.

Laboratory Findings.—The urine was strongly acid and contained a trace of albumin. The glucose test was negative. There were numerous pus cells (in clumps) and bacilli, but no casts and no blood. The urine sediment was stained for tubercle bacilli, but none was found. Upon culture of the bladder urine, colon bacilli predominated, and there was a short chained streptococcus.

White blood cells were 10,200; red blood cells, 3,100,000, and hemoglobin 4.6 gm. per 100 c.c. (28 per cent Sahli scale). There were 51 per cent polymorphonuclears, 46 per cent lymphocytes, large mononuclears and transitionals 2 per cent, and one per cent acidophils. There was some variation in size and shape of red cells, but no nucleated reds. No malarial parasites were found. The Wassermann was negative. In the spinal fluid, pressure was not increased, there were two cells, and solids were not increased. The Wassermann was negative in all dosages up to 1 c.c. July 11, urine from the ureters was examined. From the right the specific gravity was 1.004, pus was abundant, and there were many bacilli and cocci. From the left the specific gravity was 1.010, there was no pus, epithelium was very abundant. A few hyalin and granular casts were found. The patient has been referred to a competent pediatrician and neurologist. We were unable to make a diagnosis. Our diagnosis was chronic retention of urine (cause unknown). The patient returned to her family physician with instructions to him to empty the bladder and irrigate it with boric acid.

Case 4.—A girl two years and four months old, was admitted to our clinic August 31, 1925. The chief complaint was sudden enlargement of the abdomen. The family history was negative as far as obtainable. (She was an illegitimate child). She was delivered normally and breast fed. She had never been sick until the present condition developed.

While bathing the baby August 26, 1925, the mother noticed that the baby's abdomen was larger than normal. The child complained of no symptoms and apparently had not suffered. The mother stated: "The child has not been sick a day in its life." The family physician was called in and advised surgical attention.

The baby was well nourished and apparently normal in every respect. On inspection the abdomen was quite distended, more on the right than on the left. There was a large tumor-like mass situated in the right iliac region extending up to the umbilicus. The mass was irregular in outline, slightly movable, and apparently attached to the right flank. It could not be definitely determined by palpation whether the tumor was a firm growth or a cyst. Cystoscopy, ureteral catheterization and urography were determined upon.

Fig. VII, Case 3.
Illustrating right hydro-ureter filled by cystogram, child 6 years old.

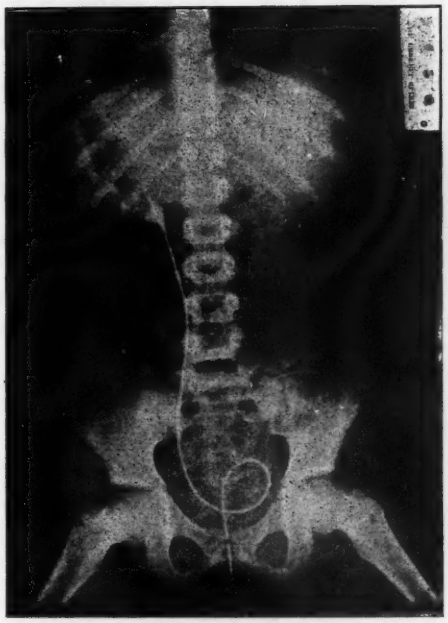

Fig. VIII, Case 2.
Normal pyelogram in child 8 years old. Symptoms of chronic recurrent pyelitis.

Cystoscopy.—A small baby Wolfe cystoscope was used. The bladder was normal in every respect. Both ureteral openings were normal in appearance and location. An attempt to catheterize the right ureter with a No. 5 F. radiographic catheter was unsuccessful. A No. 4 F. non-radiographic catheter was substituted and passed to the right kidney pelvis without difficulty. A No. 5 F. radiographic catheter was then passed to the pelvis of the left kidney. The left kidney functioned normally, but only a drop or two of urine could be obtained from the right.

Laboratory Findings.—The urine contained a definite trace of albumin, but no glucose. In the sediment pus cells were numerous (in clumps), and there were no casts or blood. Urine from the right ureter contained no pus, but red blood cells were numerous. From the left there was no pus, and blood was abundant. Culture of the bladder urine gave abundant growth of a very short gram-negative bacillus. In the blood there were 24,700 white blood cells, 3,580,000 red blood cells and 10.55 gm. hemoglobin per 100 c.c. (61 per cent on the Sahli scale). Wassermann was negative.

X-ray showed increased density in the region of the mass, especially over the lower lumbar vertebrae. It was not sharply demonstrated, and not satisfactory. A cystogram and barium enema would be of service. A pyelogram with neo-silvol was made. A right ureter pyelogram showed the ureter deflected by the tumor mass past the mid-line and to the left. The pelvis of the kidney was dilated and rounded in outline with loss of all the calyx detail. Opinion varied as to diagnosis in this case. The following diagnoses were considered: (1) polycystic kidney, (2) simple cyst of right kidney, (3) ovarian cyst, (4) malignant tumor of right kidney. We finally decided the condition was a malignant tumor of the right kidney, probably embryonic in character. This was the final pre-operative diagnosis. At operation a large malignant tumor of right kidney was removed with the following pathological report in summary:

The weight was 1127 gm. (20x13x9 cm.). There was a large neoplasm of the lower pole of the kidney. The kidney itself appeared as a thin cap at the upper pole. Microscopically, the growth was seen to be a typical mixed embryonal tumor of the kidney (Willms' Tumor).

Case 5.—A girl, 18½ months old, was admitted to our clinic Feb. 21, 1925. The chief complaints were (1) temperature ranging in the afternoon from 102 to 104° F. for the preceding two months; (2) pyuria. She was delivered July 31, 1923, at State Hospital, Columbia, S. C., by cesarean section. She was bottle-fed and it was very difficult to get food that would agree with her. She developed slowly, but was well until six months before. She had pertussis (severe attack) followed by broncho-pneumonia.

About January 1, 1925, the mother noticed a very disagreeable odor of the urine and had a specimen examined. A diagnosis of pyelitis was made. The baby's temperature went to 102 to 104° F. without apparent cause. The family physician, feeling that the case did not respond to medical treatment, referred her to me for examination. The patient was quite delicate and anemic looking, fretful and irritable. The tonsils were slightly hypertrophied and almost met in the median line. The pillows and pharynx appeared red. A superficial general examination by me gave the impression that the physical findings were negative.

The external genitalia were negative. She voided urine quite frequently and it was difficult to obtain a catheterized specimen. A small cystoscope was passed with some difficulty but without trauma. The bladder was irritable, with second degree cystitis, especially in the region of the trigone. Both ureteral openings appeared red and edematous and pouty. The right could not be catheterized for more than 2 c.m. (This was quite unusual for a No. 4 non-radiographic catheter was used.) I thought there was a spasm of the right ureteral opening, although there may have been obstruction. The left gave the same pouting appearance, but was catheterized with a No. 4 F. non-radiographic catheter without difficulty or without meeting obstruction.

Laboratory Findings.—The urine was acid with a trace of albumin, and the glucose test negative. In the sediment there were numerous pus cells (in clumps), no casts and an occasional red blood cell. Culture of the bladder urine showed a mixed growth of staphylococcus and a Gram-negative bacillus. Urine from the right ureter contained no pus, an occasional red blood cell, and abundant epithelium in various sized flakes. The left had no pus, and epithelium in large flakes. The blood showed 56 per cent hemoglobin, 3,580,000 red blood cells, and 20,700 white blood cells. There were 44 per cent polymorphonuclears, 25 per cent lymphocytes (slight lymphocytosis for her age), mononuclears and transitionals 2.5 per cent, acidophils 0.5 per cent, basophils 1 per cent. There were marked achromia, no poikylocytosis, and a nor-

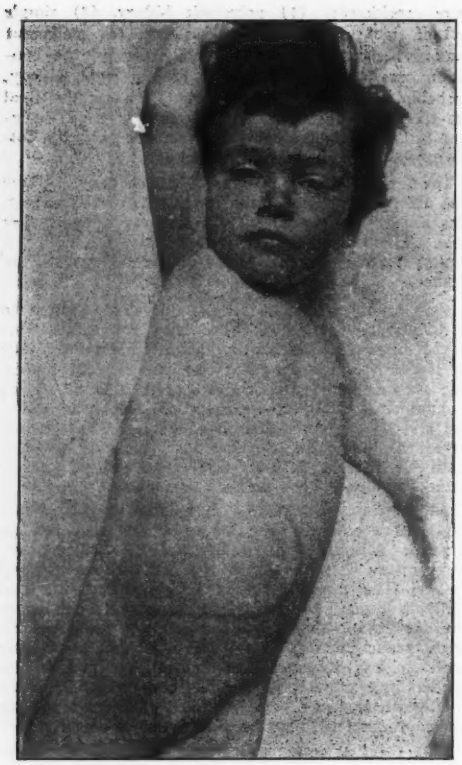

Fig. IX, Case 4
Showing outline of abdominal mass, child 2 years old.

mal number of blood platelets. X-ray showed the intestinal tract and stomach distended with gas. No stone shadows were made out in the urinary tract. Upon culture of urine from the left kidney, one small colony of Gram-negative bacilli was obtained. Although there was no pus from either kidney, a diagnosis of acute pyelitis was quite evident. A diagnosis of recurrent pyelitis of colon bacillic type was made, and the pelvis of both kidneys irrigated, with very gratifying results.

Case 6.—A girl 2½ years old, was admitted to our clinic May 9, 1925, on account of recurrent attacks of high temperature with pyuria. The family history was negative. She had been delivered normally, and had never been sick until August, 1924, when she had a high temperature followed by a large amount of pus in the urine. She had numerous "bowel upsets" during the summer of 1924, and was sent to Saluda, N. C., to be properly fed and to get rid of the colitis.

For the preceding two weeks before admission she had had a temperature of 102° F. with a large amount of pus in the urine. She had had four similar attacks since August, 1924, with a temperature varying from 99 to 102° F., and on every occasion the urine contained large quantities of pus. Medical treatment in this case has been notably unsuccessful, and Dr. Wm. L. Simpson, of Rock Hill, S. C., brought the child to me for opinion and advice as to pelvic lavage. About the external genitalia there was nothing remarkable. She was cystoscoped under ether anesthesia. There was no difficulty in passing the cystoscope after filling the bladder. The bladder was normal except in the region of the ureteral ridge and surrounding each ureteral opening, where there was definite evidence of bullous cystitis. Both ureteral openings were large and gaping. Without difficulty a No. 5 radiographic catheter was passed to the pelvis of each kidney. Many bullae completely surrounded the left ureteral opening and most of the pathological findings were on that side.

Laboratory Findings.—The urine was acid, with a trace of albumin. Glucose test was negative. In the sediment, pus cells were fairly numerous (in clumps), bacilli abundant (in clumps), and non-motile. An occasional small granular cast, no blood, and few epithelial cells were found. Culture of the bladder urine showed Gram-negative bacilli in pure abundant growth (*Bacillus coli*). Urine from the right ureter had 2 to 3 white blood cells to a high power field, numerous epithelial cells, and a few red blood cells. From the left there were 2 to 3 white blood cells to a high power field, numerous epithelial cells, and a few red blood cells. Culture of urine from the right ureter showed 4 to 5 colonies of a Gram-negative bacillus. Heavy growth of a Gram-negative bacillus was obtained from the left. There were 13,500 white blood cells, 45 per cent polymorphonuclears, 51 per cent lymphocytes, 3 per cent large mononuclears and transitionals and 1 per cent acidophils. Upon x-ray examination, no stone shadows were seen. A left pyelogram showed a normal pelvis, with the ureter dilated down to the bladder wall. The diagnosis appeared to be recurrent bilateral pyelitis of the colon bacillic type. The treatment was lavage of the pelvis of each kidney, with 0.5 per cent silver nitrate solution, with very pleasing results and steady improvement.

Case 7.—A girl, two years old, was admitted to our clinic September 18, 1925. The chief complaints were: (1) intermittent attacks of high temperature; (2) frequency of urination with pyuria. The family history was negative. The past medical history had no bearing on the present condition.

A year before the examination in July, the patient had a severe attack of colitis but there were no special symptoms directing attention to the bladder or kidneys until January, 1924. Since January, 1924, the child has had one attack a month which was accompanied by high temperature with frequency of urination. Since August, 1924, the mother thought the attacks had become more frequent, but not so severe. Pyuria resisted all medical treatment.

About the external genitalia there was nothing remarkable. Cystoscopic examination was unsatisfactory on account of blurring of the lens of the cystoscope, but both ureters were catheterized without difficulty.

The urine was acid, with a faint trace of albumin. Glucose test was negative. In the sediment, pus cells were fairly numerous (in clumps), there were a few bacilli, no casts, and a few red blood cells. Urine from the right ureter contained no pus. Red blood cells were fairly numerous. In the urine from the left side there were 2 to 4 pus cells to a high power

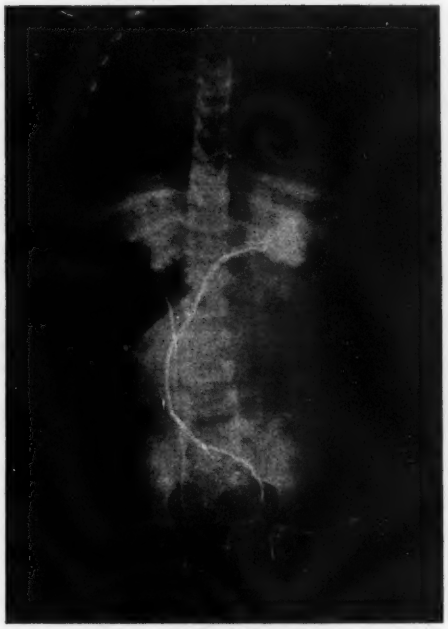

Fig. X, Case 4
Child 2 years old catheterized with right pyelogram. Note marked deflection of catheter to left side.

field and red blood cells were fairly numerous. Culture of urine from the right ureter showed pure growth of a Gram-negative bacillus. From the left also pure growth of a Gram-negative bacillus was obtained. There were 9,500 white blood cells, 4,480,000 red blood cells and 73 per cent hemoglobin; 54 per cent polymorphonuclears, 42 per cent lymphocytes, 2 per cent acidophils, and 2 per cent large mononuclears and transitionals. No malarial parasites were found, no achromia and no nucleated reds.

Upon x-ray the kidneys and bladder were negative. Catheters were passed up to the kidneys. The left pyelogram showed normal filling of the pelvis. The opinion was recurrent left pyelitis. The left kidney was lavaged with mercurochrome with very pleasing results. The child became progressively better.

Case 8.—A girl of 13 months, was admitted to our clinic May 26, 1925. The chief complaints were high temperature and pyuria. The family history was negative. She had been normally delivered and breast fed. She had never had any sickness until a few days before when she developed an ordinary cold. She had no injury or operation.

Two weeks before she began to have enuresis. Following enuresis her temperature ranged from 101 to 104° F., and it had been continuous for two weeks. On May 23, 1925, the urine was examined by the family physician, who found a large amount of pus. On inspection the baby was fairly well nourished, quite toxic, and from all outward manifestations an exceedingly sick child. She was pale, had a "pasty" look, and lay in a semi-stuporous condition.

The external genitalia were negative. She was cystoscoped under ether anesthesia (only 4 drams of ether being used). The cystoscope was introduced without difficulty, both ureters were catheterized. The bladder was normal and both ureteral openings appeared normal.

The urine was faintly acid, glucose test negative, and there was a definite trace of albumin in the sediment, pus cells were very numerous (in clumps), there were a very occasional red blood cell, a few bacilli, and no casts. Culture of the bladder urine gave a heavy growth of a Gram-negative bacillus. The white blood cells were 31,000. There were 66 per cent polymorphonuclears, 22 per cent lymphocytes and 12 per cent mononuclears and transitionals. Urine from the right ureter had a specific gravity of 1.005, 1 to 3 pus cells to a high power field, and an occasional red blood cell. Urine from the left had a specific gravity of 1.004, 1 to 4 pus cells to a high power field, and an occasional red blood cell. A left ureteropyelogram showed a normal ureter and kidney pelvis. The conditions appeared to be acute bilateral pyelonephritis. Each kidney pelvis was irrigated with 2 per cent solution of mercurochrome. In 48 hours the temperature fell to normal and the child made a continuous and successful recovery.

Case 9.—A girl aged three years old, was admitted to our clinic August 24, 1925. The chief complaint was intermittent attacks of high temperature with pyuria. The family history was negative. She had had recurrent attacks of tonsillitis, and the tonsils were removed three weeks previously. She was very well developed, but anemic looking. The external genitalia was negative. There was no difficulty in passing the

Fig. XI.
Illustrating hydro-ureter in male child 6 years old. Filled by means of cystogram.

cystoscope. She had second degree cystitis in the region of the trigone. The ureteral openings were normal in location and appearance. Both ureters were catheterized to the kidney pelvis without difficulty.

The urine was acid with a definite trace of albumin. Glucose test was negative. In the sediment the pus cells were numerous (in clumps), there were no casts, and no blood. Urine from the right ureter had a specific gravity of 1.005, and no pus. From the left a specific gravity of 1.005 and no pus. Upon x-ray the kidneys and bladder were negative. The opinion given was recurrent attacks of pyelitis of the colon bacillus type. (A period of remission at the present time.) A pediatrician, Dr. Jno. R. Ashe, was called in to see the patient for a physical examination, and observation was advised.

Case 10.—A girl, six years old, was admitted to our clinic August 31, 1925. The chief complaint was recurrent attacks of colicky pains in the right iliac region, referred to the region of the bladder and genitalia. The attacks of colic were accompanied with frequency of urination and hematuria. A diagnosis of ureteral calculus, right (lower third) had been made by Dr. George R. Livermore, Memphis, Tenn. The stone had been manipulated by him. X-ray showed a stone at the lower end of the left ureter back of the bladder wall. The child was in good condition and the stone produced no symptoms. Cystoscopy and cystoscopic manipulation of the stone was not advised.

CONCLUSIONS

(1) The applicability of modern urologic methods of diagnosis and treatment to young children is not generally appreciated.

(2) Urologists should strive to create a wide-spread interest in this subject among general practitioners and pediatricians.

(3) The urologic problems of diagnosis and treatment differ little in child and adult.

(4) There are no contra-indications to modern urologic diagnosis and treatment in young children except as instrumentation is contra-indicated on account of anatomic differences.

(5) With a closer cooperation between general practitioner, pediatrician and urologist and with wide-spread interest created in the subject, more children will receive thorough urologic studies and proper treatment.

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DISCUSSION (Abstract)

Dr. A. I. Folsom, Dallas, Texas.—It is surprising how widespread the impression is that the urological examination is a formidable affair, which is dangerous for children to undergo. The urologists of the country, first, should sell themselves to the idea that this is not only a thoroughly safe procedure, but one that may be instituted where indicated without very much hesitation. After this, a definite effort should be made, and is being made in some places, to convince the general practitioner and the pediatrician that these cases should be referred for urological examinations.

Children tolerate a cystoscopy and ureteral catheterization at least as well, if not better, than the adult does. There seems to be less reaction following the procedure, and I have had no case where there was any cause for worry or alarm following the cystoscopy or pyelography. These cases are cystoscoped almost as easily as the adult, and in a great many instances, very much more easily.

I cystoscope very small children, two, three and four years of age, without a general anesthetic in the office. If I can exclude the mother and father from the room, in a majority of cases, the children are easily controlled and submit to the procedure with really a minimum amount of objection. Often they behave very much better than the adult does. It therefore becomes a matter of interesting ourselves in the work, to attempt this work regularly and routinely.

A very wide diversity of pathology will be found in young children suffering with urological conditions. They are subject to the same diseases and are affected very much in the same way that adults are, and as in adults, the proper diagnosis should be determined early, so that proper measures may be taken for the relief of the conditions present. Many of these can be cleared up very definitely and very easily, if they are diagnosed early enough to allow the institution of proper treatment before the condition gets beyond control.

Urological examination in children has been a hobby of mine for the last seven or eight years. It has been one of the most satisfactory works that I have done, and I do not hesitate to recommend these examinations in infants and children, almost routinely. Of course it must be remembered that there are conditions, not only in the infant, but in the adult, where cystoscopy is definitely contra-indicated. Except in that small group of cases, a careful and complete urological study should be made of all children suffering from urological conditions.

Dr. C. L. Peacock, New Orleans, La.—This particular field in urology has really been neglected. The most satisfactory method of conducting cystoscopy in children has been under general anesthesia, ethylene being our choice. Few examinations have been made under local. One girl of six submitted without any anesthetic.

Urological conditions in children are more frequent than is generally supposed. I do not agree with Dr. McKay in regard to urethotomy. Meatotomy when indicated can be done without material injury and in most instances with benefit to patient.

As a rule children respond to treatment in less time and with fewer treatments than adults.

Dr. Clinton K. Smith, Kansas City, Mo.—Unques-

tionably the interest now manifested in the study of urology in children from the standpoint of modern diagnostic methods, will greatly clarify some of the obscurities of adult urinary pathology.

During the past two years at Children's Mercy Hospital in Kansas City, we have been making uretero-pyelograms on all our autopsies, noting the capacity and filling pressure. We have acquired some interesting information which has been of practical use in the study of urology in children, for example, in cases of pyelitis. In infancy and early childhood the ureter is comparatively larger, shorter and more club-like in contour. Pyelitis is, in comparison, a different problem. There is less likelihood of poor drainage and the cases show a more pronounced tendency toward recovery, with expectant therapy. In the older children, pyelitis, especially the chronic type, is, as in adults, largely a matter of poor ureteral function, obstruction, and to get results thorough ureteral dilatation is required.

It is gratifying to see some of these children who have been undernourished and anemic for years, gain their normal weight and appearance after a few dilatations of the ureter to nine or ten French.

Dr. Henry G. Bugbee, New York, N. Y.—While the perfection of cystoscopes, especially those of small calibre, has made it possible to carry out urologic investigations quite as thoroughly in children as in adults, one should carefully consider the indications for such a procedure. We are most frequently asked to see children with urinary infections and these children either have an acute infection with pronounced symptoms or a chronic infection which does not clear up under treatment. The acute infections as a rule respond readily to proper medical treatment, but if with the institution of such treatment improvement does not take place at once, cystoscopic investigation is indicated. Acute urinary infections in children are most often pyelonephritis. Ureteral catheterization with maintenance of the ureteral catheter in the kidney often gives immediate relief. In the chronic infections which do not yield to proper medication and general systemic measures, a true underlying lesion in the urinary tract has been found to be so often present that a cystoscopic examination which will be complete with roentgenograms and pyelography if necessary, should be made. In my work at the Babies' Hospital, we found this to be so often true that we were led to review the pathological material removed at necropsies, and in conjunction with Dr. Wallstein I found in the records of 4907 necropsies a definite lesion of the urinary tract in 117 cases. In all there was a superimposed infection. Congenital anomalies played an important role. While these examinations are possible and when carried out with the proper technic will involve no real risk to the patient, one should be sure that the patient has had the benefit of correct treatment, which has not resulted in a cure. On the other hand, continuation of treatment which does not eliminate the signs and symptoms of a possible urological lesion in an infant is entirely unjustifiable without a complete knowledge of the urinary tract.

Dr. H. F. Helmholz, Rochester, Minn.—In all cases of chronic pyelitis which do not yield to treatment in the course of three or four weeks, it is absolutely essential that a thorough urologic examination be made. In the majority of instances it will be found that the reason for the persistence of the infection is some interference with the normal flow of urine. In this group of cases I would like particularly to emphasize the frequency with which we have found cordbladders.

Dr. Courtney W. Shropshire, Birmingham, Ala.—I have had a number of cases of pyelitis in children that would not respond to urotropin, alternated with alkalin treatment, but in which beneficial results were accomplished by a pelvic lavage of the kidney.

I wish to report a case treated in the Urologic Department of the Norwood clinic, Birmingham. A five-year-old colored boy had hematuria. Wassermann was negative. The urine was dark blood red, specific gravity 10.25, and the blood contained albumin, but no sugar. There was a large amount of pus and blood.

Under ether anesthesia a catheter was introduced into the bladder, and the bladder washed until the return water was clear. A Wappler infant cystoscope was introduced into the bladder. The bladder mucosa was markedly congested, and there was a syphilitic ulcer about the size of a dime to the right and just below the right ureteral os. This ulcer had the characteristic appearance of a typical syphilitic ulcer. Ureteral catheters passed into the pelves of both kidneys without any obstruction, and microscopical urinalysis of the urine of each kidney was negative.

The child was placed upon Gray's powders and increasing doses of saturated solution of potassium iodid. In a few days the hemorrhage disappeared, and in two weeks another cystoscopic examination, done under ether, showed a normal bladder mucosa and the ulcer half healed. The child was kept upon this treatment and in about a month cystoscopic examination revealed a normal bladder and complete absence of the ulcer.

I am reporting this case in detail because hematuria is rather uncommon in children. I do not recall a report of a case of syphilitic ulcer of the bladder that was diagnosed cystoscopically, treated and followed to its ultimate recovery. The Wassermann blood test was negative. However, owing to the predominance of syphilitic infection in the colored race, to the fact that we have only 85 or 90 per cent positives in hereditary syphilitics, and because of the characteristic appearance of the ulcer, I felt justified in placing this child upon anti-syphilitic treatment, to which he responded very promptly.

Dr. Bransford Lewis, St. Louis, Mo.—The whole question boiled down to a few words, brings us to the necessity for accurate diagnosis, in children as well as adults; and such diagnosis can only be reached through the use of the cystoscope and other modern instruments of precision. Such instruments can be used on children as well as on adults, contrary to the belief of many not conversant with this work.

Dr. Geo. R. Livermore, Memphis, Tenn.—I wish especially to condemn the practice of diagnosing pus in the urine in children as pyelitis and treating it with potassium citrate without a thorough urological examination. Children stand a cystoscopy better than adults, and it is perfectly safe unless the blood urea and creatinin are high.

ANAEROBIC STREPTOCOCCI: THEIR ROLE IN PUERPERAL INFECTION*†

By Otto Schwarz, M.D.,
and
W. J. Dieckmann, M.D.,
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Although anaerobic streptococci were described by Kronig as early as 1895, very little has been written concerning these organisms, and the part they play in puerperal infection. At about the same time that Kronig described them, Menge demonstrated that they frequently exist in the vagina. Wegelius, in 1908, in what we consider the most thorough study of the vaginal flora, found an anaerobic streptococcus in six out of ten normal post partum cases on the ninth day after delivery, both in the vagina and the uterus; and on the fourth day, four times in the uterus and six times in the vagina. Before delivery he found anaerobic streptococci twice in the vagina in this series of ten cases. In this study, culturing both aerobically and anaerobically, he demonstrated thirty-six different organisms. In 1899, Kronig reported that there were anaerobic streptococci that were true parasites. Little of importance was written about the role these organisms play in puerperal infection until 1910. At that time the work of Schottmuller appeared.

In the English as well as the American literature, no specific article was published describing this organism as a frequent causative agent in puerperal infection. It is apparent that in bacterial studies, both in this country and in England, anaerobic culture methods have not been widely used. From a study of the articles dealing with puerperal infection or the vaginal flora, anaerobic organisms have seldom been sought. So far as we know, in this country, the only serious case of puerperal infection due to anaerobic streptococci was reported by Little, in the service of Dr. Whitridge Williams, in 1905.

Our interest in anaerobic organisms was stimulated by the fact that frequent negative cultures were obtained in cases which we felt were obviously infected clinically. Anaerobic organisms were not sought for until July, 1924, when the Department of Obstetrics took over its own bacteriological work. After that time, all uterine and blood cultures were grown both aerobically and anaerobically. In the early part of this work we became interested in the previous researches of Schottmuller, in which he described the role played anaerobic streptococci in various infections, and in which he described a certain anaerobic streptococcus which had definite characteristics, which he called the Streptococcus putridus.

As this article, to our knowledge, has not been discussed widely in the English literature, we shall describe Schottmuller's work in some detail. In his first article which appeared in 1910, Schottmuller briefly reviewed the rather scant literature on the subject up to that time. In this paper he reported a total of twenty-five cases, with a mortality of 13, or 50 per cent. These cases were chiefly cases of puerperal infections following abortions, although there were several cases of otitis media, gangrene of the lung, and pulmonary tuberculosis. The number of puerperal infections was seventeen, with seven deaths or 41 per cent. In puerperal thrombophlebitis due to anaerobic streptococci he reported a mortality of 78 per cent. He states that this report of twenty-five cases indicates that the anaerobic streptococcus is a virulent pathogenic organism and cannot be regarded as a parasite, because once having invaded the tissues, the thrombi or blood stream, it has pathological properties. It is isolated 14 times in conjunction with other organisms in these cases, and 12 times it was the etiological agent.

Schottmuller objects to the view that anaerobic streptococci should be considered as bacteria which invade the body after disease, because of the fact that his investigations extended to all of the various organs and they began with the onset of the disease and ended at the autopsy table. His description of the organism is as follows:

> On artificial culture media it forms long and short chains. The individual organisms are usually not round, but flattened and lie opposite one another (diplococci). Eight, ten, or more diplococci form at times a tortuous chain. The single cells do not always have the above described form, but at times on cultures they become rod shaped and all different shapes, so that one is forced to believe that the culture is contaminated. They stain readily and are Gram-positive. The organism does not grow in the presence of oxygen, but on the contrary, is so sensitive that it grows only after expulsion of all the oxygen. For this reason only those methods can be used in which all of the oxygen is removed and kept

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†Read in Section on Obstetrics, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., Nov. 9-12, 1925.

Bacteria.	Accompanying Bacteria.	Blood Culture		Uterine, etc. Culture		Number of Days Temp. of 38° or Higher.			Total Mortality 2½ yrs.
		Positive	Mortality	Positive	Mortality	Maximum	Minimum	Average	
Streptococcus Hemolyticus 11 1	B.Coli.	4	2	9 1	2	77	15	17 (10)	3
Streptococcus Viridans 2		P.M. 1.	1	P.M. 1.	1	31	9	20	1
Non-Hemolytic Streptococcus 3		2	1	3	1	14	4	9	1
Staphylococcus Albus 2 Aureus 1		2 1	2	1	1	22	5	13*	1 1 at home.
Streptococcus Putridus 3 3	Anaer. Strepto.	1	1	3 3	3	41 11	6 3	24 7	3
Anaerobic Streptococcus 11 3 1 2 1	B. Coli. Staphy. Albus Anaero. Bac. B.Subtilis	3 1		10 3 1 2 1	1	21	5	13	1
Anaerobic Cocci 2 2	B.Coli & Anaer.B.	1		2 2		14	3	7	61

Cultures	Positive	Negative	Total
Blood	34	89	123
Uterine	35	7	42
Abscesses Etc.	11	1	12

CHART 1.

away. These requirements are best met in agar. The usual mixture of a stab culture to which a reducing substance has been added is the best medium on which to grow the streptococci.

Since 1903, he has been successful in obtaining the organism from the blood of a number of serious cases of puerperal infection. The blood was placed immediately in bouillon and without further handling in the incubator. In this apparent aerobic condition the streptococci grew, but on further culture were obligate anaerobes. Naturally they were anaerobic from the start and the growth in the broth was only apparently aerobic. The anaerobic character of these cultures, although apparently under aerobic conditions, was due to the fact that the venous blood which quickly clotted or settled to the bottom, excluded the oxygen from the cocci, so that they found excellent growth conditions. Growths are obtained in twenty-four hours, and a much better growth is seen in forty-eight hours in the anaerobic zone of agar tubes. The Streptococcus putridus, as Schottmuller has named this organism, causes a putrid odor, particularly in blood bouillon cultures. The blood takes on a characteristic poppy-red color and in the spectrum one can demonstrate hydrogen sulfid with certainty. In about ten days the blood cultures are black in color. The last described property of the Streptococcus putridus is exceedingly characteristic. Not only in the cultures but also in the pathogenic processes in the diseased body can it be demonstrated. The pus or blood in which the Streptococcus putridus is growing always has this characteristic odor, for which it was named.

Anaerobic streptococci are described by Kronig, which do not produce this gas. On account of the anaerobic condition necessary for the growth of this organism it appears remarkable that in lung cavities and bronchi which are continually filled with oxygen, anaerobic streptococci can grow. There are apparently similar conditions to those seen in the blood bouillon cultures. The bronchiectasic lungs, abscesses and cavities offer these bacteria favorable growth conditions, just as does blood broth. He thinks that the infection of the lower air passages takes place apparently from the mouth. In the cases of abscess or gangrene the embolic route must be considered. He feels that the latter route is particularly prevalent in lung abscesses which occur in general infections with the Streptococcus putridus, as observations show in puerperal sepsis.

His experience shows that the Streptococcus putridus infections most frequently follow abortions. He feels that this indicates that in abortion the organisms are introduced into the uterus either with the hands or with instruments. He emphasizes that most of these abortions were criminal, and the infection of the uterus from the vagina is self-evident. He states that the occurrence of anaerobic streptococci in the normal vagina has been proved and therefore auto-infections can occur. The subsequent invasion of the uterus is also possible, and fatal auto-infections of Streptococcus putridus can occur. He points out that in abortions only 3 per cent die, which indicates that the uterus in early abortion is not so easily infected as at term. The thrombosed vessels in the endometrium at term are much more numerous and larger. Naturally the mortality is higher in these patients. He feels that the site of entrance of the Streptococcus putri-

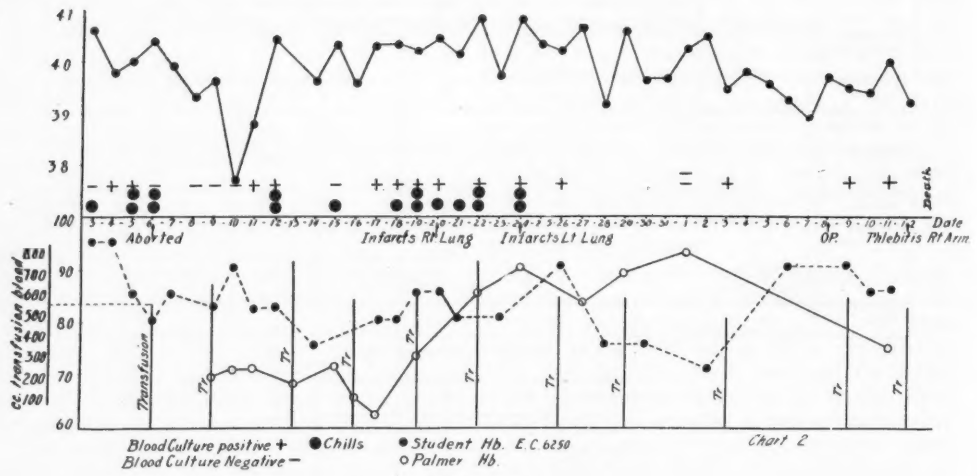


CHART 2.

dus in these cases of thrombophlebitis is always by way of the endometrium. Here, the organism invades the uterine wall, parametrium and thrombosed veins. The thrombosed veins in contradistinction to the circulating blood, offer a fine culture medium. The proliferating organism dissolves the thrombi and small particles break off and gain access to the blood and other organs, particularly the lungs.

Clinically, there is a putrid lochia. Usually the uterus contains retained secundines. The fever is high, inconstant and intermittent in character. Chills are common, in one case as high as forty-six. The pulse runs parallel to the temperature, ranging from 100 to 140. At first, respiration is not affected, but as occurs frequently in this type of infection, when symptoms of pneumonia appear respiration becomes rapid. The general appearance remains good at first, but becomes much worse as a result of the continued fever and lung involvement. Often in the parametrium one can find a finger-like band of induration extending laterally, which grows larger on observation. By degrees a marked anemia develops which is characterized by a considerable decrease of the hemoglobin and the number of red blood cells. Leucocytes vary from 6,000 to 16,000. In the latter half of the disease symptoms of pneumonia develop, usually in the right lower lobe. Sputum is gelatinous and yellowish-brown in color. Further, the Streptococcus putridus, with marked regularity, causes lung abscesses, due to emboli from digested thrombi. From this a pleurisy eventually develops. At the termination of the infection the lung symptoms are most pronounced. There is dyspnea, cyanosis, and a tormenting cough. Death is due to heart failure. The duration is variable. The infection does not belong to the rapid form of sepsis.

In the treatment of these cases Schottmuller emphasizes that an exact diagnosis is of the utmost importance and the therapy depends on this diagnosis. He is of the opinion that in cases of thrombophlebitis which are due to Streptococcus putridus infection an operation is to be considered, which consists of ligation of both ovarian and internal iliac veins. The operation, if it is to be successful, should not be delayed too long, or one will find the thrombus extension in the vena cava. If the fever and chills continue the patient eventually dies. He warns that operation should not be attempted until signs of progressive thrombophlebitis develop, characterized by repeated chills after emptying the uterus, and tender bands in the parametrium. Repeated blood cultures with an increased number of colonies are also signs to be considered as indications for operation. He warns, however, that every case must be analyzed clinically, and that he is in no position, at the time the article was written, to advise definitely for or against operation.

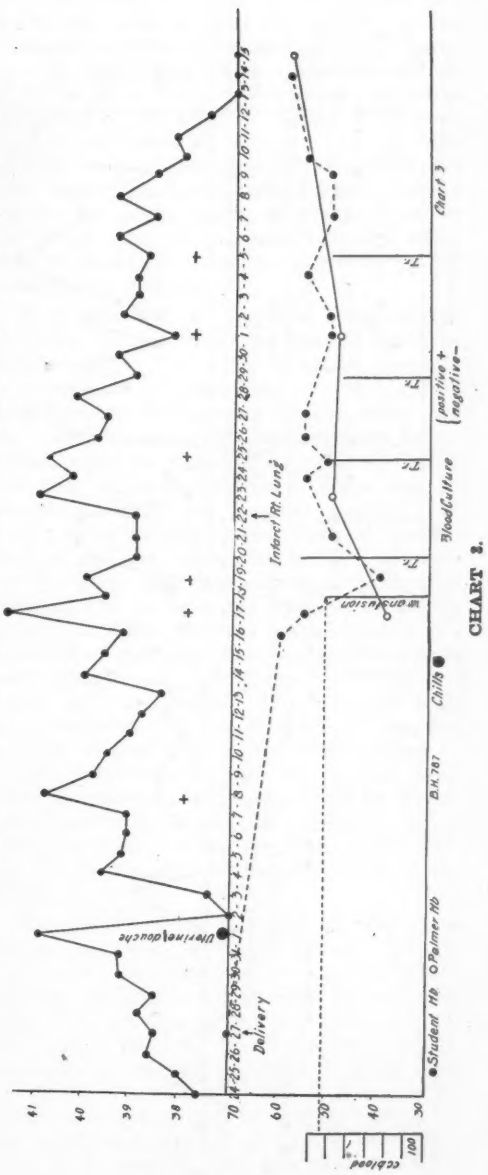
Schottmuller stated also that it is not true that in sapremia bacteria cannot get into the blood stream, but that sapremia is actually a

local infection that might also be general. Anaerobic streptococci can also produce peritonitis, with a fatal outcome.

The work of Schottmuller was confirmed on a small scale by several workers before the onset of the World War. In 1921, an article appeared from the Schottmuller Clinic by Bingold, in which the pathogenicity of the Streptococcus putridus was further emphasized. The extent to which this work has now been carried out at the Schottmuller Clinic is very clearly brought out in a monograph by Schottmuller on cultural methods, which was published in 1923. This shows that in 231 fatal puerperal cases following labor, the Streptococcus putridus was present seventy-two times. In forty-one of these cases death was due to peritonitis. The Streptococcus putridus in this series was present seven times in mixed infections. This is in marked contrast to the experience following abortions. In 600 cases of infected abortion the Streptococcus putridus was found only four times in pure culture and 300 times in mixed infections.

Also, it is to be emphasized that in a recent study of puerperal infection in England based on 249 cases which answer certain definite criteria, no mention is made of the anaerobic streptococcus as having any great importance as a causative factor of puerperal infection. In seventy-nine cases in which blood cultures were sterile, and we take it that there was no peritonitis in these cases, sixteen died and sixty-three recovered. Undoubtedly the sixteen that died, provided peritonitis was eliminated, may have been cases of anaerobic streptococcus blood stream infection. The report of the Rotunda Hospital in this resume is particularly interesting. In a period of four years, during which 14,380 deliveries occurred, 6,810 being in the hospital and 7,570 in the homes, there were fifty-seven cases of puerperal infection, with twenty-nine deaths. The hemolytic streptococcus was responsible for thirty-two of the infections, with fourteen deaths. In one case an anaerobic streptococcus was recovered from the blood stream with death following. The routine in culturing was the use of blood agar plates, and therefore the finding of this single case of anaerobic streptococcus infection must have been accidental.

The importance of this organism as a causative factor in puerperal infection in this country has been apparently overlooked. Williams and de Lee, in their text books, both refer to the anaerobic organism of Schottmuller, and



Williams dismisses the subject by saying that Schottmuller felt that this organism was the most frequent offender in puerperal infection. Williams states that although anaerobic streptococci are occasionally found in puerperal infection, it appears that Schottmuller's state-

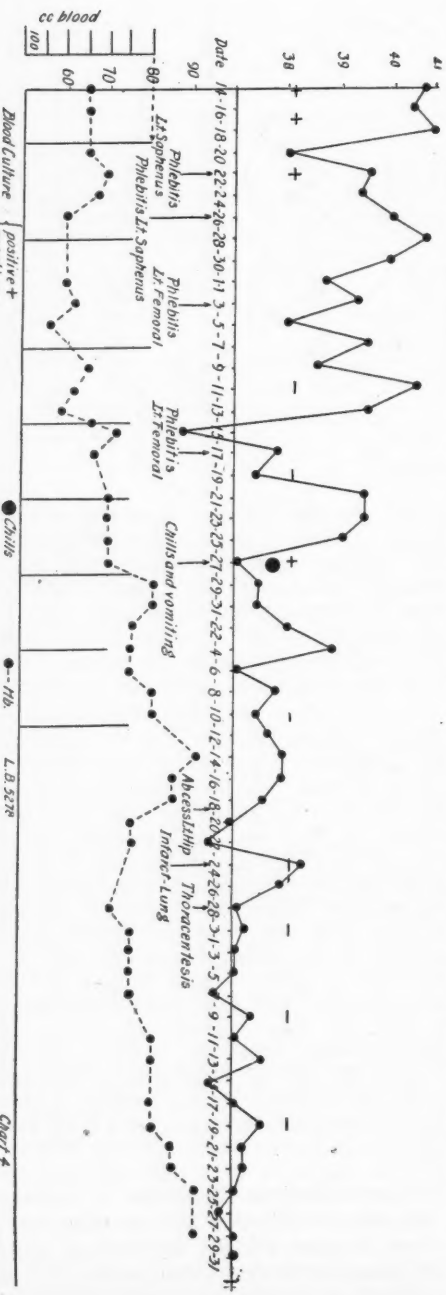


CHART 4.

ments as regards the frequency of this infection are apparently too sweeping.

In the American literature the only reference that we have been able to find regarding the seriousness of puerperal infection due to anaerobic streptococci was the case reported from Williams Clinic by Little in 1905. This case was a case of incomplete abortion, with curettage, thrombophlebitis and bacteremia following, and ending in death. An anaerobic streptococcus was accidentally found in a deep blood agar tube. The same organism was recovered from the uterus and the blood. The patient ran a high temperature, was jaundiced on the sixth day, and died on the eighteenth day. The autopsy showed a clean uterine cavity, thrombosis of the vena cava, left common iliac, femoral and saphenous veins, partial thrombosis of the right common iliac, embolic atelectasis in the lung, general anemia, with acute splenic tumor and infarct of the spleen. There was no formation of gas in the organs. This undoubtedly was practically a case of mono-infection of anaerobic streptococcus.

Our experience with this organism dates back to July, 1924. In going over cases previous to this date in which negative bacteriology was reported, we can with some certainty pick out cases which may have been due to this organism. Exclusive of several cases in the hospital at present, we have done 165 uterine cultures, and blood cultures in suspected infected cases. Forty-six of these cultures were positive for Streptococcus putridus. Twenty-one were positive for anaerobic streptococci. (See *Chart* 1). It will readily be seen that we have found anaerobic streptococci quite frequently. We have not called most of these definitely Streptococcus putridus. We have put them under the second classification because they did not answer entirely all the cultural properties of this organism, but in most cases clinically they acted in a similar manner. From our limited experience with this work, it appears that this organism is most frequently present following labor at full term, particularly in those cases which are terminated after a second stage by a fairly difficult operative procedure, especially if the membranes have been ruptured for some time.

The previous bacteriological work, particularly that of Menge and Wegelius, has shown that this organism, or one of the anaerobic streptococci, is frequently found in the vagina

and we feel that they must have the ability under certain conditions to invade the lymphatics and thrombi in the veins of the uterine wall. Therefore these infections may be regarded in many instances as being auto-infections. It is interesting to mention that they appear chiefly in our colored wards, and no serious infection of this type occurred in the private service of the hospital where patients are examined much more frequently than in the wards. We attribute this to the difference in personal cleanliness of these individuals.

In view of our experiences during the past year and a half, we feel that the work of Schottmuller may be considered as expressing the proper incidence of the various types of puerperal infection, and that the characteristics he described in the clinical course of these cases of Streptococcus putridus have all been substantiated in every form in this brief experience that we have had. At least, anaerobic streptococci play a considerable role as causative factors in puerperal infection.

This organism, like that of other puerperal infections, has the power of destroying red blood cells and lowering the hemoglobin content of the blood. Hence it is advisable to treat the patients freely by blood transfusion. We use the citrate method and give 500 to 800 c.c. of blood at from three to seven day intervals, in some instances over a period of seven or eight weeks. We feel that this perhaps will prove the most successful way of handling these cases. The only other procedure for cases with extension of thrombi to the pelvic veins is that suggested by Schottmuller, of complete ligation. The importance of this operative procedure has also been emphasized by Bondy. Ligation, if it is done, should be carried out only in cases of Streptococcus putridus infection. As ligation, to be successful, must be carried out early, we feel that many cases would be operated upon in which the procedure was not necessary, and as the operation apparently carries with it a definite mortality, such radical measures are not justified

In the treatment of cases of puerperal bacteremia due to invasion of the hemolytic streptococcus, repeated transfusion has been of definite benefit. We feel that perhaps in anaerobic streptococcus infections blood transfusions should be more efficaciously than they have been in cases of hemolytic streptococcus infections. At the present time we are treating both types with blood transfusion. We feel that in the past, most cases of bacteremia have succumbed as a result of the marked blood destruction and because the patient in her weakened condition failed to keep up her nutrition by proper food intake. Therefore, in addition to the transfusions, we have resorted to the use of a tube which is inserted in the nose, through the posterior pharynx into the esophagus and into the stomach. Through this tube the patient can be given sufficient food to supply her caloric needs, and we suggest its use in all types of puerperal infection where food by mouth can be taken, where the patient is not eating properly.

It is important in cases of Streptococcus putridus infection that the uterine lesion be handled early. The uterus should be thoroughly cleaned out with the finger or with blunt instruments and an antiseptic douche given. We use 1 to 4000 potassium permanganate. Transfusions must be given early, preferably before any great amount of anemia develops, and repeated frequently and in great amounts, 500 c.c. or more, so long as the blood cultures are positive and the hemoglobin is low. We prefer the citrate method on account of its easy application and we have less difficulty in getting in large amounts (750 c.c.) by this method. We have had no noticeable reactions and the donors and recipients are both grouped and matched before each transfusion. We have had little experience with the use of antiseptic preparations of various kinds in the blood stream to combat infection. The efficacy of these solutions has recently been summarized in an excellent article by Polak. He apparently is not enthusiastic about these preparations and prefers to deal chiefly in frequent blood transfusion.

The routine which we have established in uterine cultures is briefly as follows: the patient is placed crosswise on the edge of the bed, and the genitalia are thoroughly cleansed and dried. They are then painted with picric acid solution, or 2 per cent mercurochrome solution. Preferably a weighted speculum is placed over the posterior vaginal wall and a flat anterior speculum is inserted. The vaginal portion of the cervix, the external os and a short portion of the cervical canal are carefully dried and painted with an antiseptic solution, again dried, and a Little's tube (usually two culture tubes are taken) is then carefully inserted into the uterus and the lochia aspirated. The tube is sealed, taken directly to the laboratory, and the contents transferred to: (1) blood agar plate; (2) anaerobic blood agar slant; (3)

meat tubes, tubes containing meat and broth which have not been filtered. (The third method was suggested by Dr. Howard Bell, formerly of the Department of Pathology.)

Blood Cultures.—We use 100 c.c. of veal infusion broth containing 0.1 per cent glucose. This is kept in 200 c.c. Florence flasks which have been covered with cotton and paper to prevent contamination. We take from 10 to 20 c.c. of blood, preferably the latter, and add it to the broth. The latter is again covered and placed in the incubator and not shaken. Blood cultures are preferably taken during, or immediately after a chill, or if there are no chills, at the height of the temperature. They should be taken frequently. Schottmuller recommends 300x50 mm. tubes (we use 210x27 mm.) which are then filled with 2 per cent glucose agar to which he adds 10-20 c.c. of blood, cools immediately and places in the incubator.

The summary of this work can be, perhaps, best presented in chart form, and a summary of the bacteriological findings in our cases is given in *Chart* 1. We have inserted special charts of seven cases, two of which are cases of hemolytic streptococcic bacteremia. We include these two cases because they represent the only two recoveries of hemolytic streptococcic bacteremia that have occurred in our service of eleven years. The charts are made in such a way that they depict the course of the disease with special reference to the temperature, hemoglobin, blood cultures, chills and transfusions. There are two lines for the hemoglobin, the dot representing the student's or interne's hemoglobin, usually determined by the Talquist, Sahli or Dare methods, and the circle representing the hemoglobin as determined in the laboratory by the Palmer method which is accurate to 1 per cent or less. We shall include a brief clinical description of these cases and we wish to emphasize particularly three of the cases of anaerobic streptococcus infection which are represented by *Charts* 2 and 3. These cases represent the classical clinical picture caused by invasion of the anaerobic streptococci into the thrombi of the uterine veins, and their subsequent breaking up and lodging in the lower lobes of the lung.

The case represented in *Chart* 2 died thirty-seven days after abortion and at autopsy there were found marked lesions of the lungs. Both lower lobes were involved with numerous abscesses as well as an extensive pneumonic process. From these lesions anaerobic streptococci were recovered in pure cultures.

Chart 3 illustrates a case similar in character, with lung involvement twenty-six days after delivery, positive blood cultures, and resolution or healing of the lung condition with prompt recovery.

Another case had a rapidly terminating peritonitis five days after criminal abortion. Anaerobic streptococcus was the chief organism isolated. In this case an unidentified anaerobic bacillus was also found. The pelvic abscess was evacuated and a rubber drainage tube inserted. This case, which is described as *Case* 8 in the paper, at autopsy showed a marked general peritonitis, with walling off only in the pelvis.

Chart 4, *Case* 3, describes the clinical course, with recovery, of a case of marked bacteremia due to hemolytic streptococcus following an abortion.

CONCLUSIONS

We conclude from this work that anaerobic streptococci are frequently the causative factors of puerperal infection, that they cause chiefly a local foul-smelling lochia and in their non-invasive state may be regarded as saprophytes. However, under certain favorable conditions such as in the thrombi of the uterine veins, they subsequently reach the blood stream and cause serious and even fatal local complications.

If the organisms are present in the uterus in overwhelming numbers they may be carried to the peritoneum by way of the lymphatics, as our *Case* 8 illustrates.

In the treatment of these cases we recommend thorough cleansing of the uterus. In the event of a blood stream infection we recommend early and frequent transfusion to combat the anemia and bring up the patient's resistance. We feel that on account of the saprophytic properties of this organism in the non-invasive state, this method of treatment, with emphasis also on the nutritional needs of the patient, will ultimately give the best results.

Finally, in order that the real significance of this organism can be appreciated, it is necessary in all cases of suspected puerperal infection to grow uterine cultures both aerobically and anaerobically, in order that the incidence and seriousness of this organism can be better appreciated.

We wish to express our thanks and appreciation to Dr. A. I. Kendall, Professor of Bacteriology, Washington University, for many valuable suggestions that he has given during the progress of this work.

ABSTRACTS OF HISTORIES OF CASES ON WHICH CHARTS ARE BASED

E. C., 6250, *Case* 1, *Chart* 2.—The patient entered the hospital with a history that her menstrual period

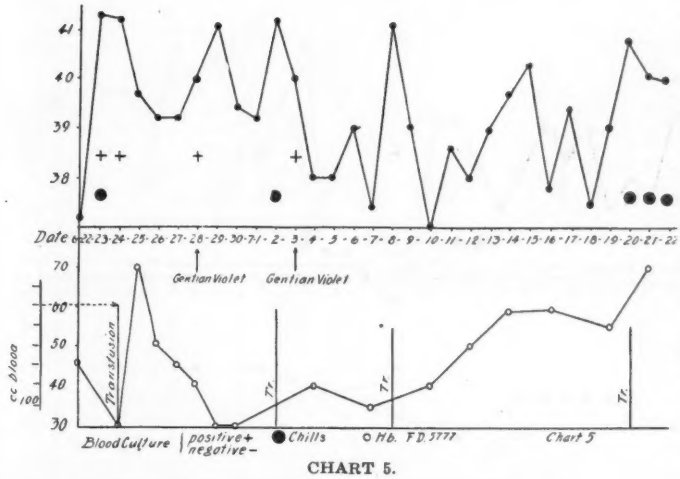


CHART 5.

was overdue three weeks, and that she had inserted a slippery elm stick into the uterin cavity on November 30, 1924, for about one minute. The following day she began to have fever. On December 2 she had chills. Blood culture on December 4 was positive, giving the same organism which was recovered from the uterus. The diagnosis was made of incomplete abortion, acute endometritis (Streptococcus putridus), pelvic thrombophlebitis, bacteremia (Streptococcus putridus), infarcts of lung, abscess of back, and thrombophlebitis of the veins of the arm. She was treated with transfusions, mercurochrome and neo-arsphenamin. She died on January 13, 1925 (44 days after introducing the stick). White blood cells were 10,000 - 25,200.

Autopsy.—The abdomen and pelvis were essentially negative. The entire lower lobe of the right lung was firm and on section showed numerous infarcts and abscesses. At the base of the left lung was an area of consolidation, which on section showed small abscesses. There was no definite sinus tract from the right lung to the scapular abscess, but the right lung was densely adherent throughout and consensus of opinion was that the abscess resulted either from rupture of empyema, or from direct extension.

B. H., No. 787, *Case* 2, *Chart* 3.—The patient entered the hospital August 24, 1925, having irregular contractions. She was delivered on August 27, of twins after a labor of fifty-four hours. First perineal forceps and second, version were used. The membranes had ruptured spontaneously at some time on August 25. She had a temperature of 38° C. before delivery. Her temperature was normal for two days following uterine irrigation on September 1. The diagnosis was made of acute endometritis (anaerobic streptococcus), pelvic thrombophlebitis, bacteremia (anaerobic streptococcus), and infarcts of the lung. She was treated with transfusions and discharged well on October 19, 1925. White blood cells were 13,100-28,500.

L. B., No. 5278, *Case* 3, *Chart* 4.—The patient was sent into the hospital for an operation. She gave a history of spontaneous abortion about seven weeks previously, followed by profuse bleeding, for which she was curetted five days later. She had been sick ever since, although she was able to be up at times. For the preceding week she had retained no food and only small amounts of water by mouth. The diagnosis was made of pelvic thrombophlebitis, with eventual extension to the veins of both legs, streptococcus hemolyticus bacteremia, infarct of the left lung, pleurisy and abscess of the hip. She received blood transfusions, autogenous vaccine and anti-streptococcus serum, besides symptomatic treatment. She was in the hospital from December 14, 1923, to April 19, 1924. She was discharged well. The white blood count was 6,500-15,000.

S. M., No. 5665, Case 4, Chart 5.—The patient entered the hospital on May 9, 1924, having irregular contractions and a temperature of 37.7° C, which had been 101.4° F. in the out-patient department. She was delivered of a macerated fetus on May 10, 1924, after a spontaneous labor of seventeen hours. The membranes ruptured ten minutes before delivery. There were two vaginal examinations and two rectal during the course of labor. The diagnosis of acute endometritis and pelvic cellulitis was made. Uterine culture was not grown anaerobically. Blood cultures were not grown anaerobically (not taken at proper time), and an insufficient amount of blood was taken. White blood cells were 6,200 - 21,500. There were never any lung symptoms.

F. D., No. 5777, *Case* 5, *Chart* 6.—The patient entered the hospital June 22, 1924, with a history of one severe vaginal hemorrhage on May 30, which required packing, and another on June 12, which required packing. She was delivered by a midwife on June 14, 1924. Three days later she began to have chills and fever. The diagnosis was made of acute endometritis, pelvic cellulitis, and bacteremia (Staphylococcus albus). She was treated with gentian violet and transfusions. There was marked improvement with negative blood cultures, but the patient left the hospital against our advice, and died at home about one month later. White blood cells were 6,200 - 19,000.

M. H., No. 6451, *Case* 6, *Chart* 7.—The patient was brought into the hospital on February 12, 1925, from the out-patient department. She had been delivered on February 4, 1925, after a spontaneous labor of eight hours. There was one rectal and one vaginal examination. The onset was February 7, with chill and fever. The diagnosis was made of acute endometritis (Streptococcus hemolyticus), and pelvic cellulitis. She was treated with transfusions, and discharged well on March 15, 1925. White blood cells were 9,000-22,600.

H. W., No. 6725, *Case* 7, *Chart* 8.—The patient was brought into the hospital on May 25, 1925, from the out-patient department. She had been delivered on May 21, with no vaginal or rectal examinations. The

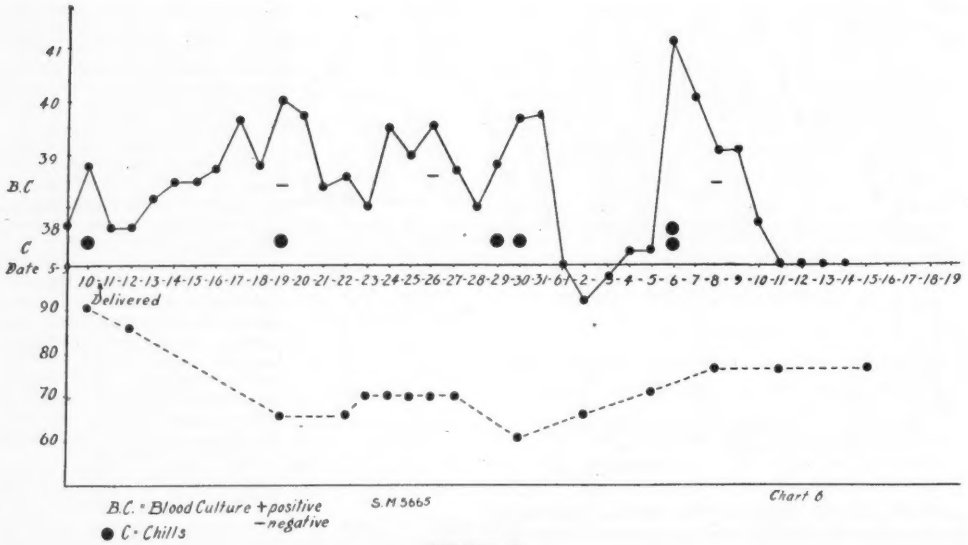


CHART 6.

diagnosis was made of acute endometritis (Streptococcus hemolyticus), pelvic cellulitis, pelvic peritonitis, and bacteremia (Streptococcus hemolyticus). She was treated with blood transfusions and symptomatically. From May 30 to June 2, inclusive, she received daily injections of approximately 5000 c.c. of fluid by intravenous and subcutaneous routes, and nothing by mouth. She was discharged well on June 24, 1925. Her white blood cells were 17,000 - 40,000.

F. W., No. 6164, *Case* 8.—The patient entered the hospital on November 2, 1924, with a history that her menses were about two weeks overdue, and that she had inserted a douche nozzle into the uterine cavity on October 29. Twelve hours later she had abdominal cramps, with chills and fever. On October 30 she began to vomit. The diagnosis was made of incomplete abortion, endometritis (Streptococcus putridus), and peritonitis. Cul-de-sac puncture on November 4 released 100 c.c. or more of foul-smelling pus, which contained the same organisms which were recovered from the uterus. It was noted at operation that there was no "walling off" of the infection. The patient received intravenous mercurochrome and one blood transfusion, but died the following morning, November 5, 1924. She was dead one week after insertion of the nozzle.

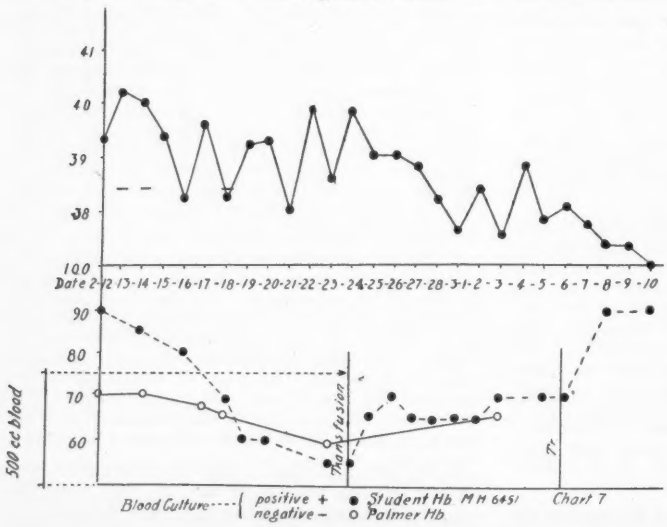


CHART 7.

Autopsy Findings.—There was suppurative endometritis of the puerperal uterus, parametris, septic thrombophlebitis and acute general fibrino-purulent peritonitis, with pelvic peritoneal abscesses, and left fibrino-purulent pleurisy.

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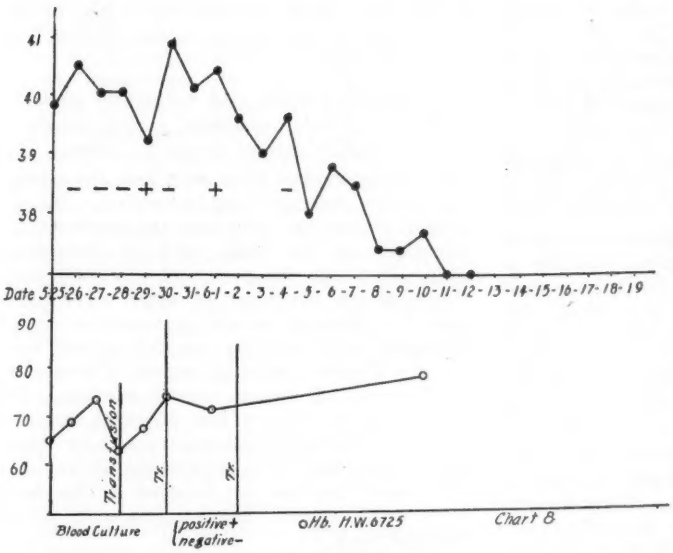

CHART 8.

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INTERPRETATION OF RAILWAY SIGNALS BY THE SENSE OF COLOR*

By ARCHIBALD E. CHACE, B.A., M.D., F.A.C.S., Texarkana, Ark.

This subject is too voluminous for comprehensive treatment in a short paper. An attempt will be made to outline some of the important factors which are of interest to surgeons who examine applicants for employment.

It is necessary to understand the fundamental physical properties of light and the mechanism of the color sense so far as known. The application of these facts in making a test which is both quantitative as well as qualitative is not productive of good reasoning, nor can any data on this problem be obtained, without a knowledge of such facts.

Physics of Light.—A very incomplete description of the physics of light suffices for the present purpose. The nature of light is beyond our ken, yet we should gain some conception of the approved theory. It has helped me, to think of it in terms of radio parlance. Both fall within the electromagnetic wave theory, which seems to have had its origin in James Clerk Maxwell's mathematical researches. Many of you have had difficulty in tuning out broadcasting stations whose wave lengths approached that of the desired station. How much more finely must the human eye tune for color perception, because the wave lengths of the entire color range from red to violet of the solar spectrum, differ by only three-tenths of one millionth of a meter, or 0.3 of 1/1000 of a millimeter; whereas the broadcast radio range is at least 400 meters, or more than 1000 million times greater. Stated in another way, color perception is our natural way of distinguishing the difference in wave length at the microscopic end of the great series of electro-magnetic waves in that fugitive substance called the ether, the red waves being about 0.7 of a micron in length; the violet about 0.4; and the other colors in between. Since the velocity of light (186,000 miles per second) is the same for all colors, it follows that the shorter the wave length, the greater the number per second. Roughly, this number varies from 700 billion at the violet to 400 billion at the red end of the spectrum.

Physiology of Color Sense.—The mechanism by which these wave lengths are translated into sensations of color is still a matter of speculation. No less than eleven theories by well known authorities are found in the literature. From the mass of conflicting theory a few facts may be safely gathered for our use. The detectors in our radio receiving set are the cones of the retina, not the rods, and they are activated not by light directly, but indirectly by photochemical changes set up in the retina when a ray of light penetrates the vitreous. The stimulus thus generated passes along the optic nerve to the visual centers. Thus it becomes

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evident that the ability of the retina to respond by photochemical decomposition, the number, distribution and efficiency of the cones, and the efficiency of the afferent nerve tracts and brain centers, are all factors in our sense of color.

Pathology.—The pathology of color sensation, judging from the literature, is an equally confusing subject. A survey of the Italian, German, French, English and American literature forces one to the conclusion that any degree of color blindness may exist, from the inability to distinguish minute differences up to total color blindness, where the subject sees all colors as shades of grey, or variations of intensity. The classifications of color blindness are also confusing. One hears of Daltonian color blindness, or red-green blindness, or dichromic color sense, all of which are said to be identical. Some well recognized authorities state that it is difficult to find any two cases of color blindness exactly alike. Although some degrees of pathology exists in six and one-half to eleven per cent (according to various authorities) of all men and about one per cent of all women, I have not been able to obtain any data as to the relative per cent of congenital, acquired permanent, acquired temporary, and color defects due to scotomata and to contracted visual fields for color. It seems to be generally assumed in the literature that all congenital color blindness is of all degrees, is permanent, transmitted by sex-linked recessive heredity (Fuchs), usually covers the whole visual field, is due to unknown pathology, and is occasionally unilateral.

Acquired color blindness is due to scotomata or changes in the optic nerve, or conduction paths, and centers of the cerebrum, caused either by toxemias or definite lesions of disease. Of the toxemias, alcohol (especially wood alcohol) poisoning, nicotine poisoning, and the familiar toxemias of disease probably all play some part. The major role is by some given to syphilis, yet, although authorities leave the impression that the toxemia of the secondary stage may cause color blindness, in my experience it is the definite lesion of the central nervous system in the third or even so-called para-syphilitic stage which is the real cause of acquired color blindness, aside from the scotomata due to the toxemias, and most probably caused by retrobulbar neuritis. Of the microscopic changes in the retina, conductive and perceptive apparatus in color blindness, little seems to be known. According to Fuchs of Vienna, the lesion is most commonly an atrophy of the optic nerve, causing first a loss of the color sense for red and green, then yellow, and lastly, for blue.

Extraneous Factors.—In connection with the pathology of color sensation a note regarding the surrounding factors should be added. Besides color, or more accurately hue, the human eye detects intensity and saturation. By intensity (shade) is understood the brightness or luminosity of the light, and by saturation (tint) is meant the purity of the color with regard to the admixture of white. The intricate interrelations of the pathology of color perception with intensity, saturation, and various eye diseases, including errors of refraction, are too complex for our present purpose. We must, however, always bear in mind that the color blind learn to distinguish colors by intensity or brightness to a remarkable degree. For this reason they are not detected by the usual tests, and become a very real danger in certain railroad work.

Classification of Color Blindness.—To be practical, we must from this hazy pathology obtain a working classification, at least, of the cases of color blindness, if we are to be able to say that this man cannot work safely, and that man can. There are three methods of classification: (1) the man is described as blind to a certain color or colors, (2) the man is classed from dichromic to hexachromic with shortened spectrum, or, (3) the wave lengths missing from the spectrum as seen are determined either accurately or roughly. The last is by every one recognized as the most accurate, if not the most practical.

TESTS FOR COLOR BLINDNESS

The means of classification are certain tests, of which I have been able to get examples or descriptions of one hundred. These may be classified into groups according to purpose and method.

As to purpose a test may be qualitative, quantitative, or both. It is qualitative if its purpose is to determine the presence or absence of the various colors in the applicant's spectrum as seen. It is quantitative if it determines the size and distance at which, or the density of the neutral screen through which, various colors may be seen. Sometimes both methods may be combined in the same apparatus. Another differentiation may be made as to purpose if color blindness per se, or color ignorance, is to be determined, or both. Some

tests determine scotomata and contracted visual color fields.

As to method, reflected light (as in worsted tests), transmitted light (as in lantern tests), and the prismatic dispersion of white light (spectroscopic methods) are all used. Confusion colors are those most easily mistaken for rose or light green by the color blind dichromic, are determined by experience, and usually prepared by a color-blind artist. A test by comparison determines color blindness; a test which requires the applicant to name the colors shown determines color ignorance. The perimeter maps out the visual fields for color. A small dot of light at a distance of 20 or more feet, shown for an instant, or a prompt response required, shows the presence or absence of a central scotoma for that color. Some tests are very interesting and ingenious, some founded upon scientific data, some upon personal experience.

Group 1.—The group in most common use is qualitative, by comparison of reflected light which subtends more than five degrees. The Holmgren worsted test is of this group, and in very general use on American railroads. The Thompson stick is a convenient modification, and Jenning's test is another ingenious, self-recording modification. In a subdivision of the same group are water-color washes, crayons which may be self-recording, colored powders, colored boxes, colored pellets, colored tissue paper, in fact, colored almost anything. There are at least eighteen modifications of the Holmgren test alone. The principle back of these tests is that of the confusion color—the normal pick out various shades and tints of the same hue, the abnormal confuse other hues with the rose (red) or green test colors. Undoubtedly when the worsteds are not faded, such tests pick out the red or green total blind, but fail in red-green scotomata, in detecting color ignorance, and in detecting all other forms of color blindness, including shortened spectrum. These tests according to the most experienced observers in Germany and England fail to pick out about fifty per cent of the dangerously color blind in marine and railroad service. They are, however, convenient tests, and, if their limitations are thoroughly appreciated, of use in conjunction with other tests, but never alone, for the examination of men in train, yard and engine service.

Group 2.—Another group consists of tests by reflected light where colors are mixed by motion, such as rotating discs, tops, cylinders, cones, etc., viewed at a visual angle of more than five degrees for qualitative and at a smaller angle for quantitative tests, and observed either directly or through a chromatic cell. They are interesting, some no doubt of scientific but limited value, but all impractical for our purpose.

Group 3.—The complementary shadow group is based upon the fact that when a colored light is thrown upon a white screen and an opaque object causes a shadow on the colored surface, the shadow will be of the complementary color to the normal, and colorless to the color blind. These are so evidently impractical for our use, and of such limited scope, that they must be discarded. For convenience in this group may also be placed the tests based upon the phenomenon of successive contrast, or negative and positive after images.

Group 4.—The quantitative tests by reflected light are based upon the normal vision, by which one recognizes the color of a disc one mm. in diameter at a distance of five meters (Donder's formula). By various sizes of discs, or by varying the distance, an accurate measure of the strength of vision for any color may be obtained.

Group 5.—A group similar to group one, but much more practical, is based upon reflected light and confusion colors. Figures are of rose or light green, are partly hidden in a background of confusion color or discs, or the colors of figure and background are reversed. These figures are easily seen by the normal, but entirely lost to the color blind. Stilling's plates are the standard of this group, and of great use in convincing officials, and friends of the candidate. They fail to detect color ignorance, small scotomata, some forms of blindness, including shortened spectrum.

Group 6.—Tests for central color scotomata. Fridenberg's instrument appearing like an ophthalmoscope, but having colored glasses in place of lenses, various diaphragms, and a spring actuated shutter for almost instantaneous exposures, is of this group. The same effect may be had in lanterns which have small diaphragms, and a means of flashing the light. A pin-point of light looked at directly must fall on the fovea and so a central scotoma may

be revealed, if time is not permitted to move the eye. Oliver's pellet test is also well devised to detect central scotomata down to two degrees in diameter.

Group 7.—Spectroscopes. Several types have been devised, the simplest form showing the solar spectrum. The candidate is required to name the colors at the various wave lengths. If memorizing could be done away with, this test is the most scientific of all, except for central scotomata. Another type shows two spectra, one reversed, one above the other, with a slit across both giving monochromatic light from each; and the candidate is required to compare the two colors. Here color ignorance also is not taken into account.

Group 8.—The anomaloscope, and similar instruments, form still another group, for comparison of two transmitted lights, one of which is varied by optical means between red and green, mixed by addition, and the sodium yellow which is varied in intensity (Raleigh's test). This instrument has been popular on European railways, but is not so broad in scope as some others.

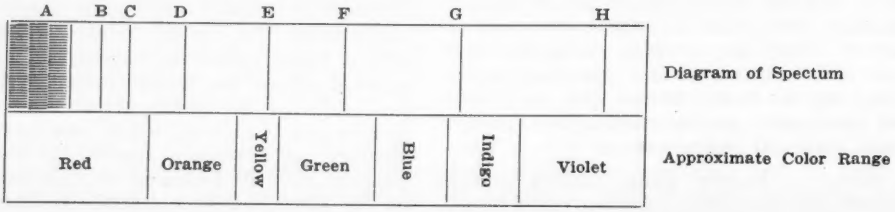
Group 9.—The polariscope has been used by Chibret and Tomlinson (Chibret's chromatophotoptometer). Rose's polariscope is used to compare complementary colors by varying the intensity. The colors unseen are clearly demonstrated.

Group 10.—Some of the color testing lanterns have the advantage of broad and accurate usefulness, simplicity of operation, and the cheapness of mechanical operation as compared with optical. Those most frequently used are Eldridge-Green's, Thompson's and William's. There are others, such as Welsh's, Middleton's, the English Board of Trade lantern and Donder's. Some of these lanterns test by color comparison, showing two or three colors at one time. Others test both color sense and knowledge by requiring the single color shown at a time to be named. Most lanterns have diaphragms by which quantitative tests may be made and color scotomata determined. Some have various neutral glasses (like smoke or fog to lower intensity), and ribbed and ground glass to represent rain and steam, which can be interposed between the light and candidate as well as the color. One lantern uses gradually darkened movie films to alter intensity. The colored disc should be of the same color analysis as the roundels used in railway signals plus discs of confusion colors. In the best of these lanterns, that invented by the English authority on color perception, Eldridge-Green, we have combined in a single apparatus the means to determine a shortened spectrum, a central scotoma, the quantitative value of the perception, the presence of color ignorance, the absence of any color from the candidate's spectrum, and the ability of the man to distinguish the actual lights used in railway signals under working conditions of rain, steam, fog and smoke.

Classification.—With such a lantern, and with Stilling's plates or some other simultaneous contrast test to differentiate color ignorance, one can map out on the spectrum the missing wave lengths with sufficient accuracy; the normal easily seeing six colors.

Eldridge-Green states that orange is the first color to disappear, then blue, then yellow, then red and green; and so he classifies men as hexachromic if normal, pentachromic if orange is not seen, tetrachomic if blue also is gone, trichromic when red-green blind. Monochromic vision is rare. A hexachromic man may have shortening of either end of the spectrum, or a central color scotoma.

My own judgment is that a diagram of the spectrum is the simplest and most accurate method of designating color defects; thus:



This would designate a hexachromic, or six color vision, with a shortened red end of the spectrum. So by inclosing between lines the wave lengths not seen, a very clear idea is given at a glance of the type of color vision of the applicant. To obtain such a result it is necessary to fill in accurately as the applicant names the colors or misses the simultaneous contrast tests, a pre-arranged set of tests in tabulated form, from which the applicant's spectrum is calculated.

REJECTION OF APPLICANTS

Collins made an interesting study for the U. S. Public Health Service, coming to the conclusion that men should be rejected for marine and railroad service who had any of the following defects:

(1) Those possessing a color perception containing three or less units.

(2) Those possessing a greater number of units than three who have the red end of the spectrum so shortened as to prevent the recognition of a red light at a distance of two miles.

(3) Those with a central scotoma for red and green.

RAILWAY SIGNAL ASSOCIATION

Specifications for Roundels

	Wave Length	Red	Yellow	Green	Blue	Purple	Lunar White
Violet—	.41	0	0	40	80	90	90
	.43	0	0	53	73	82	80
Blue—	.45	0	0	62	68	74	69
	.47	0	0	68	54	59	65
	.49	0	0	70	27	18	54
	.51	0	2	64	10	5	38
Green—	.53	0	8	48	2	1	22
	.55	0	18	30	2	0.5	23
Yellow—	.57	0	29	16	1	0.5	26
	.59	0	42	6	0	0	11
Orange—	.61	0	50	3	0	0	12
	.63	47	54	1	0	0	11.5
Red—	.65	74	57	0	0	0	10.5
	.67	78	57	0	0	0.2	23
	.69	75	55	0	1	12	51
	.71	74	52	0	2	52	79

Taking these postulates in order, does Collins' first statement exclude all who are dangerous in train, yard and engine service? A glance at the attached table from the latest specifications of the Railway Signal Association, to my mind, should convince anyone that it does not. His tetrachromic class cannot see orange and blue, and hence they would confuse three out of six roundels, in daily use. I believe an applicant should be able to distinguish clearly all colors of the spectrum with the exception of orange.

With the second postulate no one will take exception. The red roundel is nearly pure red. When slightly obscured by weather conditions only the longer red rays are transmitted, so a man with shortened red end of the spectrum is unable to see the signal at all. This is one of the most dangerous forms of color blindness, and is not detected at all by the usual application of the worsted tests.

With the third postulate, one also can have little objection; unless future experience should show that central scotomata occur for blue and yellow.

There are two other postulates which appear to me essential. The color ignorant are just as dangerous in train, yard and engine service as the color blind. From the standpoint of safety, what difference does it make if the engineer can distinguish colors clearly by comparison, if he calls a red light orange, or a blue one green?

Another dangerous condition arises when the color sense as a whole or in part, is much less than normal, although the applicant clearly distinguishes colors at close range. The quantitative tests given above will demonstrate this condition. Comparatively little work has been done in this field. With the smallest diaphragms of the Eldridge-Green lantern, the applicant should name unhesitatingly the red, green, yellow and blue lights at fifteen feet in a dark room.

CONCLUSIONS

(1) It is clear to me that one who has not made a study of color sense and its pathology is not in a position to test applicants for train, yard and engine service.

(2) I believe that the stations at which such tests are made should be reduced to the fewest practical number, and the work at each should be periodically checked.

(3) The usual test by worsteds alone elimi-

nates only 50 per cent of the dangerously color blind, and should be immediately discarded as the sole test of an applicant for train, yard and engine service.

(4) The Eldridge-Green type of lantern is the only lantern with sufficiently broad and accurate application to warrant the expense of purchase by American railways. It should be used in conjunction with a simultaneous comparison test of the Stilling plate type.

(5) For day signals by reflected light, as in semaphore arms, switch targets, station boards and flags, the above tests are sufficient. The saturation and intensity as well as wave length analysis of such signals vary greatly on different railroads and at different times. Such signals should have contrasting colors to prevent confusion with the background.

(6) Field tests as ordinarily conducted by railroad officials are of little value. They are supposed to be made under working conditions. As a matter of fact, they are frequently made under ideal conditions, with no conception in the mind of the official of what the tests are intended to develop, of the effect of various natural conditions, and only rarely with any knowledge of the pathology of vision. If field tests are to be made at all, they should be conducted by experts, with specially constructed apparatus, using the standard roundels and flags under all natural conditions of steam, rain, fog and smoke, daylight, night, dusk or dawn, at proper distances, with controls, by a method planned in advance to cover all of the 288 possibilities.

(7) For train, yard and engine service a man should see all the spectrum with the possible exception of orange, should not have a central color scotoma, be markedly weak in any color, or be color ignorant or aphasic. Shortening of the red end of the spectrum should be positively eliminated.

EYE, EAR, NOSE AND THROAT

A STUDY OF PITUITARY BODY TUMORS; SYMPTOMS, DIAGNOSIS, AND SURGICAL TREATMENT*

By LOUIS DAILY, M.D.,
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It may appear that a study of the pituitary body tumors is of academic interest in view of the scarcity of cases reported in literature. If, however, Hirsch, of Vienna, who is an authority on the subject, is right in stating that pituitary body tumors are almost as frequent as goiters, and that the large majority go unrecognized because of lack of knowledge of the symptoms, then I need not offer an apology for the choice of subject.

APPLIED ANATOMY

The pituitary body lies in the sella turcica of the sphenoid bone. The optic chiasma does not lie in the sulcus chiasma as is usually described, but lies about one cm. above the sulcus and is separated from it by the cisterna chiasma, a space filled up by cerebrospinal fluid. The back of the sella turcica is inclined forward. If it shows straight up in the x-ray picture, you may be sure that there is something pathological. On each side of the sella are two processes—one behind the posterior glenoid processes, and one on the lesser wing of the sphenoid in front, the anterior glenoid processes. A tumor may cause destruction of these processes so that in an x-ray picture they are missing. Any change in the anatomy of this region as shown by the x-ray points to some pathological condition, tumor or high pressure in the brain. At times in the x-ray we get shadows at the glenoid processes. These are erroneously considered pathologic. As pointed out by Hirsch, these shadows are due to bony bridges that at times normally connect the glenoid processes. The back of the sella is covered by dura, part of which dips into and lines the sella and part of which stretches across the sella, forming a diaphragm. In the diaphragm there is an opening for the stem of the pituitary body which connects the pituitary body with the brain. Operations of the pituitary body are, therefore, extradural, the body being covered by the diaphragm which is the same dura that covers the brain anywhere else. This protection makes these operations less dangerous than other intracranial procedures.

EMBRYOLOGY AND PHYSIOLOGY

The pituitary body is made up of two lobes, an anterior and a posterior. These lobes are entirely different anatomically, embryologically, histologically and physiologically. The anterior lobe is a ductless gland like the thyroid and is derived from the mucous membrane of the nasopharynx. In the embryo, a tubular diverticulum grows upwards from the primitive buccal cavity or stomodeum. Its connection with the latter is severed through the process of development and the diverticulum wanders up to the posterior lobe of the brain and forms the anterior lobe of the pituitary body. The tract along which the diverticulum travels from the nasopharynx to the anterior lobe of the pituitary body is called the hypophyseal duct or craniopharyngeal canal.

Rests of the mucous membrane of the nasopharynx and also rests of glandular tissue similar to that of the anterior lobe are often found along the craniopharyngeal canal. At times these rests may consist of both glandular and squamous epithelial cells. We call these pharyngeal hypophysis. Often we find these rests in adenoids. Probably the characteristic adenoid facies in children and the prognathous upper maxillary, crowded and irregularly placed teeth are due not to the obstruction but to the hypophyseal rests in the adenoids. In various nasal atresias where we have as much or more obstruction than in the adenoids, we never have these characteristic adenoid facies. All admit that tumors of the anterior lobe in adults cause acromegaly. Still there are cases of acromegaly reported where no tumor of the anterior lobe was found. If these cases were examined carefully, a tumor in the rests under the sella turcica would probably have been found.

The posterior lobe is derived from the brain itself and is similar to brain tissue histologically. Extracts of the posterior lobes of animals affect all organs of smooth muscles, blood vessels, and cause contraction of the uterus and hence are used in obstetrics and in intestinal paresis. When the posterior lobe is destroyed, the patient has diabetes insipidus. This is often produced by carcinomas, which may be metastases from the breasts.

*Read in Section on Eye, Ear, Nose and Throat, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Texas, November 9-12, 1925.

PATHOLOGY

The great majority of tumors of the hypophysis are from the anterior lobe, and of these the great majority are adenomas, similar to the glandular tissue of the anterior lobe. The others are derived from the rests and are called hypophyseal duct tumors, and usually have some squamous epithelium. Adenomas may also develop above the pituitary body from the stem, because, while the stem itself belongs to the posterior lobe, it is covered by epithelial cells derived from the anterior lobe, and from these epithelial cells adenomas above the hypophysis develop. The rare tumors are chondromas. In the embryo the sphenoid is divided into two parts by cartilaginous partition, which afterward disappears. From the rests of this cartilage the chondromas develop. The spinal cord in the embryo ends in the back of the sella turcica. Tumors from these rests are called chordoma tumors. We speak of tumors as intracellar if they grow only downwards against the base of the sphenoid sinus and do not extend above the diaphragm. At times these tumors fill up the whole sphenoid sinus. Usually we find this type of tumor in acromegaly. We name them intracranial tumors if they also grow upwards against the base of the brain. Here, aside from the usual symptoms of intracellar tumors, we also get symptoms of pressure in the brain and stretching of the optic nerve. Often these tumors become cystic; then we speak of them as cystic tumors. They give the same symptoms as the intracranial and intracellar tumors.

SYMPTOMS

According to Hirsch, the clinical symptoms of tumors of the pituitary body manifest themselves in three types—one in which the acromegaly is the predominating symptom; another in which adiposity and disturbance in gonadal activity are the predominating symptoms, and a third in which the characteristic change is in the color of the skin.

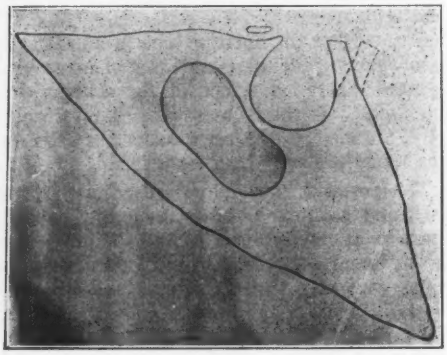

Fig. 1
Sella turcica diagramatically drawn (after Hirsch). Dotted line shows pathological position of sella.

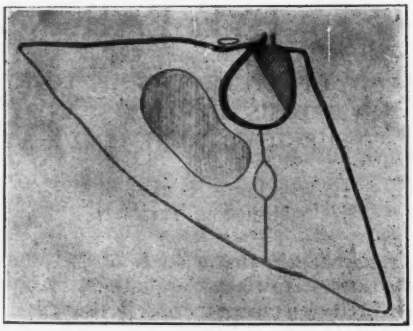

Fig. 2
Embryological development of the pituitary gland shown diagramatically (after Hirsch).

The Acromegaly Type.—The secretion of the anterior lobe is essential to life. It controls the proportional skeletal growth of the body. In hypersecretion as is usually the case in tumor, this normal proportion is disturbed. If it occurs before the epiphyses have become ossified and united, the hands and feet grow large, out of proportion to the rest of the body. Sometimes the nose, teeth and tongue, etc., grow very large. The skin becomes very thick and has a yellowish tinge. The hair grows all over the body as in a monkey. In women the hair at times grows over the face, forming a beard. Usually there is also a disturbance of gonadal activity, in the female loss of menstruation, and in the male impotency. These patients sweat freely on the slightest exertion. Even while walking very slowly the sweat will run down the face. The half moons on the nails disappear.

In hyposecretion, if this takes place in childhood, the child remains a dwarf; if in adult life, we get adiposity and disturbance in gonadal activity of the second type. Experimentally, when the anterior lobes are destroyed in young dogs, they become fat and sluggish, and their hair differs from that of the normal dog. The same process takes place in the human. The patient becomes fat and the skin becomes smooth. There is loss of hair all over the body, which is especially noticeable under the axillae and in the pubic region. The male loses hair on the face, getting a feminine appearance. The hair on

Fig. 3
Photograph of a specimen, showing part of septum, sphenoid and floor of sella removed. Pituitary gland enveloped by dura.

the head is dry, very thin and soft, and the nails become very soft. The disturbances in gonadal activity in this type are most pronounced. Women cease to menstruate and men lose their potency. While we have gonadal symptoms in acromegaly, they are not so marked as in this type. In acromegaly menstruation may come at long intervals, once in three or six months. In this type there is without any exception absolute loss of menstruation and in man impotency. If the anterior lobe is entirely destroyed, as may be caused by emboli, the patient develops cachexia, wastes away rapidly and dies in about a year or two. Simmonds, of Hamburg, first described this disease about seven years ago. He noticed patients in the Epindorf Hospital who developed cachexia and wasted away and died rapidly without any apparent cause. The anterior lobe in these cases was found entirely degenerated. He named the disease cachexia-hypophysea-priva.

In the third type the appearance of the patient is normal except for the color of his skin, which is pale yellow, like ivory, and for loss or diminution of hairs in the axillae and in the pubic region. We also have disturbance in gonadal activity in this type, but no adiposity. In the female there is slight secretion of milk from the breasts. These patients were often considered pregnant on account of the loss of menstruation and secretion from the breasts. Usually they do not sweat as freely as the second type, but they may.

DIAGNOSIS

The diagnosis is based upon the eye symptoms and x-ray of the sella turcica, in addition to the clinical symptoms mentioned. Tumors that are growing only down into the sella, i.e., intracellar tumors, do not give eye symptoms. Only those tumors that are also growing above the sella to the brain produce eye symptoms. There are many cases of acromegaly without eye symptoms. Hirsch reported more cases without than with eye symptoms. The eye symptoms are usually a bitemporal hemianopsia caused by compression of the optic chiasma. The optic chiasma lies above the sulcus chiasma and is separated from it by the cysterna chiasma (one cm.). So the tumor has to grow first large enough to fill up the cysterna before it touches the optic chiasma. Hirsch points out that the optic chiasma does not lie in front of the hypophysis, as is usually described in books, but over it. The anterior communicating artery lies over the chiasma. Each arterial pulsation beats against the chiasma, which lies upon the tumor as upon an anvil, and in time in advanced cases the artery digs a groove in the optic chiasma, and the chiasma is compressed between the tumor and the artery. The tumor being round, it first affects the chiasma at its central part, which is in contact with the highest part of the tumor. Here lie the decussating fibers that supply the inner side of the retina, the pressure upon which will first affect the most central of the crossed fibers, which supplies the lower nasal quadrants, thus producing a visual defect in both temporal upper quadrants.

Later on, the dorsal fasciculi of the crossed fibers will also be affected, and there will be a more complete bitemporal hemianopsia. A patient may see or read well, but cannot see a whole line, and when he walks he feels and touches on each side. When we have this, any eye man can make a diagnosis. But it is not always present or typical. We have three stages in the development of hemianopsia: early, middle and final. In the beginning we have a bitemporal hemianopsia for colors only. Green is lost first, then red and blue. In the middle stage there is injury of the central fibers and we get a bitemporal hemianopsia for white also. As the tumor grows the artery cuts deeper into the

Fig. 4
Photograph of a specimen showing position of optic chiasma in relation to pituitary gland.

chiasma and the lateral fibers become affected also, and we may get amaurosis of one eye and temporal hemianopsia in the other. There may be only one quadrant of vision left in one or both eyes. Finally, there is blindness in both eyes. Hirsch says he found bitemporal hemianopsia in the greatest majority of his cases. In a few cases he got homonymous hemianopsia, i.e., temporal in one eye and nasal in the other. In these cases the chiasma does not lie in the middle line, but to the side, and hence the tumor presses against one tract, which would give homonymous hemianopsia. You may have one eye completely normal and loss of vision of the nasal field in the other. This would be due to a beginning homonymous hemianopsia. This may last two or three years before the next stage develops. Hirsch claims he never saw a binasal hemianopsia, i.e., where both nasal fields were lost.

Sometimes you get a central scotoma in one eye while the other is normal. This is important in differential diagnosis, for we also get a central scotoma in retro-bulbar neuritis and in multiple sclerosis. A careful examination may reveal hemianopsia for colors and this makes one suspect pituitary disturbance. In some cases we may find that the field of vision in one or both eyes is concentrically diminished as in papillitis. In some cases of pituitary tumor you may also have a papillitis. Hirsch claims that in the majority of cases of pituitary tumor we have primary atrophy of the optic nerve. Here the artery first hammers the nerve against the tumor and it finally makes a deep impression into the nerve and constricts the sheath and you get atrophy. Papillitis is produced where there is edema of the sheath. Papillitis and neuritis are so rare in pituitary tumor that in their presence a diagnosis of pituitary tumor should be guarded. If you have neuritis or papillitis the diagnosis is doubtful, unless all the other symptoms make the diagnosis certain. Paresis of the abducens or of the oculomotor occurred in a few of Hirsch's cases. Occasionally there may be nystagmus. Pressure upon the olfactory nerve occurs often. The olfactory tract lies in front of the optic chiasma and as the tumor grows it encroaches upon it. Usually we have atrophy of the optic papilla, but the papilla may be normal in rapidly growing tumors where the symptoms were pronounced before atrophy had time to develop. Prognosis for vision is always uncertain because they may recover vision after the disks are white. I saw a case of Hirsch's who had only light sensation and white disks for one year and, after operation, regained useful vision.

Enlargement of the sella turcica shown by the x-ray is the third most important guide in the diagnosis. The pituitary body normally may differ in size which produces a normal variation in the size of the sella. But when the enlargement of the sella exceeds every anatomical possibility, then it is an important sign. In intrasellar tumor the sella may and usually does extend into the sphenoid sinus, touching the base of the sinus. When the tumor grows the back of the sella is pressed backwards, becomes thin, as thin as paper at times, and there may be destruction or erosion of the anterior glenoid processes. It is well for us to remember that enlargement of the sella, as shown by the x-ray, while it is the most important symptom of pituitary tumor, cannot be relied upon alone in making a diagnosis, because tumors of the parietal lobe, of the optic thalamus and hydrocephalus also show enlargement of the sella. In the differential diagnosis one must consider all the symptoms described before in conjunction with the x-ray picture.

Tumors of the parietal lobe, the optic thalamus or hydrocephalus do not produce acromegaly, adiposity and disturbance in gonadal activity, the pale ivory color of the skin and the characteristic eye symptoms. In hydrocephalus

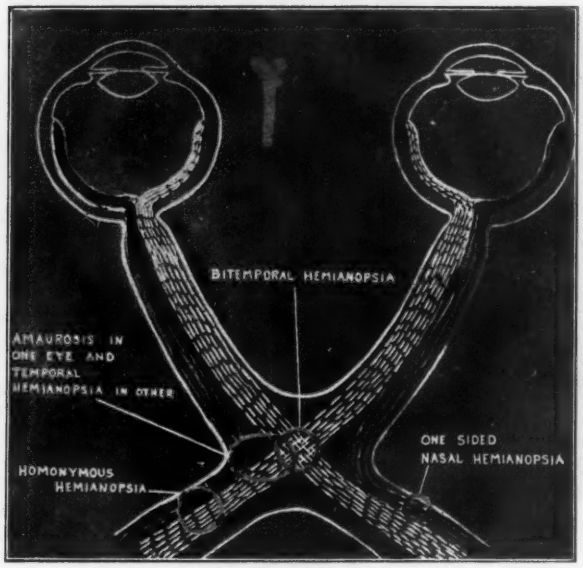
BITEMPORAL HEMIANOPSIA
AMAUROSIS IN ONE EYE AND TEMPORAL HEMIANOPSIA IN OTHER
ONE SIDED NASAL HEMIANOPSIA
HOMONYMOUS HEMIANOPSIA

Fig. 5
The circles represent lesions in these respective areas and the affect upon vision.

we get choked disks, which are rarely seen in pituitary tumor. The diagnosis should be made with utmost care and all possible precision, before operating. It is a formidable operation at best. The consequence of operating for pituitary tumor, where none is present is usually opening the third ventricle, escape of cerebrospinal fluid, meningitis and death.

TREATMENT

Treatment is principally surgical. Some good results have been obtained with pituitary extracts given by mouth or subcutaneously where there was a distinct hypo-secretion as in the second type. Some of these patients have rapidly lost weight and the other characteristics of this type under the administration of pituitary extract. But where there is hyper-secretion, as is usually the case during the active stage of acromegaly, pituitary extract will aggravate the symptoms. Again, where we have pressure symptoms upon the chiasma, and after other methods of treatment have failed, we must resort to surgical intervention. Some experimenters have reported good results in certain cases of deep x-ray therapy, in the local and general symptoms, especially in the visual field. The rays must penetrate 7 cm. and one must be careful not to injure the eyes or cause falling out of the hair.

SURGICAL PROCEDURE AND EVOLUTIONARY HISTORY

In 1886, Pierre Marie published an article describing acromegaly and its pathology. In 1901, Frohlich pointed out that tumors of the hypophysis may exist without acromegaly, but with adiposity and trophic disturbance. In 1899, Oppenheim pointed out that the x-ray shows an enlargement of the sella turcica in tumors of the hypophysis. Horsley, by animal experimentation, proved that animals continue to live after the removal of the hypophysis and to him is accredited the first attempt to remove the hypophysis in man. He did the lateral subtemporal operation; opened the middle fossa and exposed the brain. It was very difficult. Many patients died and those who survived the operation suffered paralysis of the extremities and loss of speech.

Then Krause of Germany tried the frontal approach; elevated the frontal lobe and thus reached the tumor. This operation also was very difficult. In many cases he could not reach the tumor by this method and the patient died. After a lapse of several years various men in various countries began to modify the operations of Horsley and Krause, or to combine these two. Good work along this line was done, especially in our own country by McArthur of Chicago, Frazier of Philadelphia, Dandy of Baltimore, and finally by Cushing. He exposed the anterior lobe and middle fossa, made a large opening and got the best results of all. His mortality from this operation was 49 per cent

In 1907, Schloffer of Prague reported a case operated upon successfully extra-cranially, along the sphenoid sinus route. In this operation, the nose was turned to the right side, the septum turbinates, wall of orbit, maxillary sinus and ethmoids were exenterated. His operation proved his contentions: (1) that it is not difficult to expose the hypophysis through the sphenoid; (2) that meningitis does not necessarily follow; (3) that partial extirpation gives good results in visual and trophic disturbances.

Fig. 6
Radium holder attached to a dental plate.

It was generally agreed that the trans-sphenoidal method of access is the easiest and safest, but surgeons differed as to the method of reaching the sphenoid. Knavel devised the infra-nasal method. He made incisions along the naso-labial folds and elevated the nose and removed only the turbinates and septum. This led Halstead, in 1910, to use the sub-labial incision. Cushing has adopted and evolved this method of approach to the sphenoid and is still using it at present. He uses general anesthesia. The patient is in the recumbent position. The incision is under the lip. He separates the tissues till the nasal septum is reached and resects the septum to the sphenoid. In his book published in 1912, Cushing speaks of having to resort to the subtemporal route in certain cases or of combining the trans-sphenoidal and subtemporal in two stages in certain cases. In the last few years, I understand that Cushing has limited this operation entirely to the trans-sphenoidal and since then, his mortality has been reduced.

In 1909 Hirsch first described his intra-nasal operation, which was a several stage operation and consisted of: (1) removal of the middle turbinate; (2) after several days the posterior and partly anterior ethmoidal cells are exenterated; (3) after four to eight days the anterior sphenoidal wall is removed. His operation was done in several weeks. Then in the next year he reported his new operation where access to the sphenoid is gained along the ordinary Killian sub-mucus operation. In principle the Hirsch and the Cushing operations are the same. Both reach the sphenoid along the septum except that Cushing handles it as a general surgeon would, under general anesthesia; dissecting up the upper lip, etc., Hirsch goes at it like a rhinologist, under local anesthesia; the patient in the sitting position; with a small incision, and all together intra-nasal.

I studied with Hirsch while in Vienna. His operation is comparatively simple to the nose and throat man who can do a good sub-mucus resection and who has had experience with sphenoid sinus surgery. You make a small incision along the septum as you would in a sub-mucus resection, and separate the mucus membranes. In the beginning the separation need not go downward, nor horizontally, but obliquely above the vomer to the sphenoid. Remove the cartilage above the vomer to the sphenoid, which leads to the rostrum. After you have reached the rostrum of the sphenoid and have your main land mark, separate the mucous membrane downwards and remove the vomer, which gives you more space to work. Now the mucous membrane of the anterior wall of the sphenoid is elevated and pressed to the sides exposing the ostium sphenoid one cm. on either side. With a long Middleton forceps (Hirsch's modification) you fracture the rostrum very gently, using no force, and thus open the sphenoid sinus.

If you cannot open the sphenoid in this manner you have to find the bony openings, the ostita and fracture into the sinus along these openings. These are not always easy to see, as they are placed rather laterally. The septum between the sinuses usually is destroyed in tumor. When you have opened the anterior wall of the sinus you will encounter a secondary wall just behind it, which is the saddle, pushed into the sinus by the tumor. This bony wall may be very thin, or may have a defect in it, due to the destruction of the bone by tumor, or it may be very thick and require the chisel to remove it. From one to two cm. of bone should be removed. When the dura is exposed all the instruments should be re-sterilized.

Then, the tumor is aspirated to ascertain if it is a cyst. A syringe and long needle are used and the needle is introduced 0.5 cm. into the tumor. If fluid is obtained you should aspirate two or three times so that the decompression is gradual. Otherwise, the patient may get a severe headache. An opening in the mucous membrane that lies against the anterior wall of

the sphenoid and near the septum is made to drain the cyst. Hirsch uses a rubber drain, and lets it stay in from three to five weeks. If drainage stops and the patient develops headaches he changes the drain in the first five days. As long as there is drainage, there is usually no danger of infection. In solid tumors it matters little how much of the tumor is removed. Complete removal is impossible and it will grow again in about one year.

An opening in the mucous membrane of the anterior wall of the sphenoid is made, but no drainage is inserted. Each side of the nose is packed with iodoform gauze, which is removed after twenty-four hours. After the bony floor of the saddle has been removed the tumor will force itself down into the sphenoid sinus, pressure of the chiasma will be relieved and the patient's vision will improve. The best results are obtained in cysts, but cysts are found in only about 20 per cent of the cases. The majority of pituitary tumors are solid tumors and many are malignant. In these cases the operation saves the vision by decompression, due to the removal of the bone. Three to five months later, after adhesions have formed, we remove some more of the sphenoid wall and use radium. Hirsch reports many good results after radium treatment in this type of case, and only two cases where radium had no effect whatever. He has an especially constructed dental plate apparatus to keep the radium in place.

In conclusion, I wish to emphasize that pituitary body tumor is a much more common disease than we ordinarily think and that its surgery is in the domain of the rhinologist.

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DISCUSSION (Abstract)

Dr. B. N. Colver, Battle Creek, Mich.—The subject of pituitary body tumors is within the field of the expert rhinologist who works in conjunction with the ophthalmologist, the neurologist, the internist and roentgenologist. In America, the neurological surgeon has claimed the field. In Europe, the rhinological surgeon seems to have made strong claims.

Those tumors not accessible through the sphenoid sinus are usually not of good surgical prognosis. Therefore, the transphenoidal route is the one of choice. The otolaryngologist, used to surgery of the frontal sinus, of the sphenoid sinus, to the dural manipulations necessary in mastoid or frontal sinus cases with intracranial complications, and to keyhole surgery in general, surely is well adapted technically, to undertake this delicate operation. Furthermore the operation is extradural just as the opening of a lateral sinus is extradural.

Anatomically the varying relation of the anterior communicating artery to the optic chiasm and optic tracts and to the tumor mass below clearly explains the pathogenesis of the visual changes and the prompt relief of pressure symptoms following surgery.

From a diagnostic standpoint the radiologist must remember the normal variations in size that the sella may show. Normally, regardless of the size of the sella or the variations in the clinoid processes, the back or dorsum of the sella is in a continuous line forward from the body of the occipital bone. When the dorsum is angulated backward it is a clear indication of pressure deformity of the sella.

Surgically the fact of the split layers of dura encasing the hypophysis has already been noted. The sella diaphragm constitutes a virtual, if not absolute partition protecting the general meningeal field. On the other hand the possibility of the third ventricle's being pressed down anterior to the gland must be kept in mind. Also the relation of the cystic tumors to the meninges must be remembered and any flap or window must be made by sharp cutting and not by traction.

We have been using the sub-mucus approach for sphenoid sinus operations for several years. In opening the sphenoid sinus, when the septal resection has been carried back to the ala of the vomer the nasal mucosa covering the anterior surface of the ala and of the body of the sphenoid is elevated laterally. If then a thin elevator is pressed with its edge vertical against one of the ala and gradually worked laterally, it will suddenly and easily plunge into the sinus just where the edge of the ala stops. The elevator can then be worked upward and downward to cut through the sphenoid sinus wall and thus demark the edge of the ala with a curvilinear line. The same procedure is then done on the opposite side. This so frees the thick, heavy base of bone that it is relatively easy to infract its upper portion, removing the ala and a portion of the sphenoid rostrum, giving free access into both sinuses.

We have seen several cases of pituitary body tumors in the past six years giving symptoms from loss of vision.

A young man was nearly completely blind when he came into the office. The x-ray film showed complete destruction of the sella with an area of apparent calcification high in the tumor mass. No operation was advised. He died within a few months.

Another man, age 53, presented himself with the following story: About four years previously through financial reverses, he had a severe shock. About two years previously he became suddenly depressed mentaliy, lost his will power and ambition and had not been able to work since. He was weak and stiff, not lame or sore, but unable to straighten his joints. He was very sensitive to heat and cold. He had hot flashes from two to four times a day, followed by slight sweating.

On examination his muscles were found to be soft and flabby. The skin was smooth, soft and had a peculiar yellow hue. There was an absence of hair on the body. There was a peculiar mental dullness. The fingers showed evidence of slight enlargement.

A tentative diagnosis of early acromegalic symptoms was made and the patient was referred for eye examination.

An examination of the eyes showed enlarged blind spots, and no temporal fields for green and red. The nerve heads looked "brassy," being partially atrophic.

An x-ray examination showed a markedly enlarged and deformed sella. His basal metabolism was minus 16, six weeks after operation it was minus 7.

A diagnosis of pituitary tumor was made followed by operation by the septal route. The pathologist reported adenomatous hyperplasia.

The operation was in January, 1920. The patient is still alive, in fair health and with greatly diminished but still fairly useful vision.

A man aged 54, had had trouble with his eyes for about two years. He was not able "to gather together the letters to make words." He could read signs on the street. Lately he "bumped into people on the sidewalk." Examination showed the patient to have mental confusion and dullness with failure of memory and general asthenia. He had right homonomous hemianopsia. The skin was pale and smooth. There was a little fine tremor in his outstretched hands. The sella showed loss of the clinoid processes and flattening of the dorsum. An operation was done through the sphenoid. The patient died in four days with symptoms of shock and meningeal irritation.

A girl, aged 12, about six months previous to the consultation, had had an attack of influenza with severe occipital headaches. She recovered in three weeks. Later she had a "bilious attack" at school with headache and vomiting and then became drowsy

and mentally confused. She had several such attacks at varying intervals. She was treated for some intracranial trouble not diagnosed. The family changed the attendant several times and included one osteopath and one chiropractor. She had lost 20 pounds in the preceding three months. Her vision had rapidly become defective. She complained not only of not seeing well, but of confusing spots before her eyes.

On examination of the fundus, bilateral optic neuritis was found with slight swelling of papillae, not more than 2D. A study of the field of vision showed bitemporal hemianopsia. X-ray examination showed the sella changes of pituitary body tumor.

An operation revealed erosion of the posterior wall of the sphenoid sinus with a tumor mass presenting. Aspiration proved this to be cystic. The fluid contents were gradually withdrawn and a window was cut in the cyst wall.

The patient had annoying rhinorrhea for five days, which grew less and practically ceased after seven days. On the eighth day she seemed to have caught a cold, which by the next day, showed the changes of bronchial pneumonia. She died on the twelfth day. Necropsy was refused.

A little girl of 11 is under observation at present. She had infantile paralysis in her first year. She has had considerable trouble from her bladder's failing to empty. About a year previously she had one of the ureters transplanted into the rectum. It was planned to transplant the other later, but she was taken home by her parents without having this done. While at the Mayo Clinic her eyes were examined. "The vision was diminished in the left eye with a slight suggestion of temporal pallor in that eye. X-ray of the head was negative except for slight evidence of intracranial pressure."

At present she has bilateral optic atrophy with light perception on the left only. The x-ray showed undoubted deformity of the sella with a calcareous deposit just above it. The patient is very pale, puffy around the brows and lower lids, quite emaciated and practically blind.

Dr. H. L. Hilgartner, Austin, Tex.—Defective vision and blindness are often caused by diseases of the pituitary body, especially hypopituitarism.

In hypopituitarism we note general lowered vitality, tendency to subnormal temperature, lowered pulse rate, respiration and blood pressure, and general asthenia. The function of the heart, blood vessels, and general circulation is lowered. The body surface presents smooth and dry skin, cold feet and hands, falling hair, imperfect nails and exceptionally rough skin. There is low basal metabolism. The intestinal tract shows impaired digestion, constipation, atony and intestinal toxemia.

The kidneys give low function, by the phthalein test. There is polyuria, high concentration and general kidney strain. There are headaches, dizziness, hebetude, mental morbidity, psychoses, epileptic tendency and emotionalism.

The blood is greatly impaired. There is a low per cent of hemoglobin leucopenia, low red count and lymphocytosis.

In the physical development we see thinness, fatness, bones small, increased carbohydrate metabolism, the sex organs undeveloped, a general appearance of infantilism.

There is a close relation between the embryology of the eye and the pituitary body.

There is often present a latent syphilitic condition which cannot be detected by any other known test. If it is not treated, later some of the characteristic phenomena of syphilis, such as hypophyseal gumma, may appear.

Administration of the pituitary gland or an extract of it, is important in treatment.

PREVALENCE OF SINUS INFECTION*

By M. A. LISCHKOFF, M.D.,
Pensacola, Fla.

The large number of sinus infections following the influenza epidemic of 1918 was the real awakening of the oto-laryngologist to the prevalence of sinus infection. Clinically, Chiari estimated that over a period of five years, at the Allgemeines Kraukenhause, Vienna, there was 2 per cent of sinusitis among all cases admitted. The probability is that with the refined methods of diagnosis now in use the proportion would be somewhat higher.

Post-mortem statistics are entirely at variance. Thus:

Author	Total Necropsies	Number Sinus Cases	Per Cent
Gradenigo	203	45	22
Harke	400	138	34.5
Frenkel	146	63	43
Lapulle	169	55	32
Wertheim	360	95	26
Minder	50	14	28
Kirkland	100	35	35
Toine	75	14	17
Appekofer	200	94	47

In pneumonia and influenza the percentage ran even higher. Of 92 cases of influenza examined at autopsy, 71 showed sinus disease.

The discrepancy is explained by the fact that after death the cilia cease to function and hence an accumulation of secretions in the sinuses result.

It happens too often that sinus infection is diagnosed after much secondary damage has resulted. The many cases of focal infection referred to us for diagnosis are convincing evidence. Many cases of arthritis that are unimproved till a profound investigation reveals a sinus infection and many other symptoms may result from this cause.

Patients with common colds, particularly of the recurrent variety, should have their sinuses investigated, and a surprisingly large percentage will show paranasal sinus disease. Some of the

*Read in the Section on Eye, Ear, Nose and Throat, Southern Medical Association, Nineteenth Annual Meeting, Dallas, Tex., November 9-12, 1925.

older authors who classified nasal polypi and chronic ethmoiditis as predisposing causes of asthma little realized what valuable information that is now. Reflex nasal asthma is frequently nothing more than sinusitis with constitutional involvement.

The antrum is more often diseased than the other sinuses, because in addition to the usual causes that affect it, due to its intimate relation to the teeth, many cases of dental origin occur (20-33 per cent, according to St. Clair Thompson). Its comparative ease of diagnosis may also be of importance. Beck states that unilateral sinus infection is about four times as frequent as bilateral, the anterior group about ten times as frequent as the posterior group, but that the antrum shows positive evidence of infection more frequently than either ethmoid or frontal. Pratt contends that in 50 per cent of cases the antrum acts as a reservoir and is really not primarily diseased. He states that the antrum is less diseased than either frontal or ethmoids, and that the anterior ethmoidal cells are the most often diseased and the frontal next. It is my contention that the difficulty attended in diagnosing incipient ethmoiditis would also account for its being considered as less affected than the antrum, and that our statistics should be based on actual post-mortems with routine investigation of the sinuses.

The frequent need of a pocket handkerchief, as well as the person who has to hawk and expectorate, bears investigation. That large class of cases following influenza and the exanthemata who do not improve or get well is another important group. This tends to strengthen the author's belief in pandemic sinusitis. But every sinus infection does not necessarily mean a severe empyema.

Idiopathic sinus disease probably does not exist. The most common association is with antecedent coryza. The sinuses are more or less affected in every case, but in the vast majority of cases the sinus condition resolves as soon as the coryza abates.

Certain infectious diseases, especially influenza, often induce sinusitis. This is particularly true of Europe, where the pandemics are of greater severity and the peasants are neglectful of early treatment.

Climate and diet are important etiological factors, particularly in children. In our mild Southern climates we see fewer severe cases. Mild cases classified as catarrhal and hyperplastic are probably as frequent in mild as severe climates.

Foreign bodies may enter the sinuses either by trauma or through the natural ostia. In this latter way blood, vomitus, snuff, parasites, and ferric chlorid used for epistaxis, have been exciting factors. In military practice they are a bit more frequent, due to explosions and gunshot wounds.

Traumatism may incite sinusitis either directly as in a fall or by tooth-roots falling into the antrum, or indirectly by tamponing the nose and by intra-nasal surgical procedures. Osteomyelitis, syphilis and tuberculosis only seldom are etiologic factors.

Paranasal sinus disease is not only of interest to the oto-laryngoloist but to the ophthalmologist, pediatrist, surgeon, internist, neurologist, and all practitioners of medicine.

The diagnosis of retrobulbar neuritis, choroiditis and irido-cylitis is incomplete without eliminating sinus infection. The ophthalmologist is dependent upon the drainage of infected sinuses to give his prognosis. Snydacker states that in about 10 per cent of patients who consult an ophthalmologist on account of headaches the cause is to be found in disease of the nasal accessory sinuses.

The pediatrist does not consider his examination complete in a case of pyelitis or chorea till the sinuses are eliminated. And what surgeon treats his osteomyelitis without an investigation of the paranasal sinuses for primary foci? Cases of asthma, when seen by the internist, are carefully studied and then referred for an examination of the sinuses, and the neurologist finds sinus infection a common cause of neuritis. Many nerve block cases are cleared up by surgical intervention in one or more sinuses. As oto-laryngologists, we should carefully investigate the sinuses of every hay fever patient and frequently our efforts will be well repaid. Many cases of hay fever have some etiologic factor in the sinuses. This is particularly true in children. Practically all cases of granular pharyngitis are dependent upon sinus disease, and the large class of cases who take colds in spite of everything suggested are frequently cured by intervention in the offending sinuses. The relation of headaches to paranasal sinus disease is of sufficient importance to fill an important chapter in medicine.

Dr. A. G. Andrews, of Chicago, reports the findings at necropsy of a six-year-old child, meningitis with necrosis of the roof of the sphenoid. White, of Boston, reports optic nerve involvement in children five years of age. Dean reports an infant that died at six weeks that

was under treatment for acute paranasal sinus disease. The infant had pus under pressure in every sinus. Dr. Loefler very recently told me of a child who died of meningitis. It came in with whooping cough; x-rays of the sinuses were unsatisfactory. All but the right antrum was filled with pus. Gavine Young found 43 per cent of the antra and 56 per cent of the sphenoids involved in a small number of post-mortem examinations.

All of us have observed infants running irregular temperatures due to a maxillary empyema. I recently saw a case of facial paralysis of three weeks' duration in a man 60 years of age which cleared up after proper drainage of his antrum. So contrary to general belief sinus infection occurs at all ages, from infancy to senility, in all climates and countries, only our statistics are at variance due to different methods of diagnosis and recording. Bodkin states that the number of times in which a definite infection of the maxillary antrum was found without any symptoms to suggest its presence is rather startling, and would have been overlooked had not a routine examination been made.

The maxillary sinus is primitively a pouching or evagination of the mucous membrane of the floor or lateral wall of the ethmoidal infundibulum and is in evidence about the seventieth day of fetal life. The early sinus is for a time a slit-like cavity in the membranous wall of the nose. Its extension into the body of the maxilla takes place *pari passu* with the growth of the face. The frontal sinus is, embryologically speaking in many instances, an anterior ethmoidal cell which has grown sufficiently far into the frontal region to be topographically a frontal sinus. Lack of embryologic knowledge has led to the statement that in the new-born infant no trace of a frontal sinus is visible. It may not be demonstrable at birth. As a rule, one cannot be certain of the actual frontal sinus until the sixth to the twelfth month of post-fetal life.

It must be clearly understood that no portion of the fetal sphenoidal sinus is contained within the sphenoid bone. It is necessary that resorption of the intervening nasal capsule take place before the terminal nasal sinus (early sphenoidal sinus) can come into actual contact with the body of the sphenoid bone. In infancy the sphenoidal sinus continues to be nasal in position rather than sphenoidal. The sphenoidal sinus in early childhood is more precocious than one would infer from divers statements in the literature.

The initial ethmoidal out-pouchings are in evidence as early as in the fourth month of fetal life. Later there is a division topographically into an anterior and posterior group. In early childhood both anterior and posterior cells are fairly well established and subject to disease. Probably one reason why paranasal sinus disease is not suspected more frequently is that prevalently the sinuses are undeveloped in children.

Sinus disease in children is fairly common, whether less than in adults is a question, as the symptoms are more obscure. In children general infections seem the dominating cause, such as scarlet fever, diphtheria, measles and broncho-pneumonia. Mills has shown that an infected antrum may keep up a bronchitis in children, which is cleared up by its cure.

The most common source of infection of the sinuses is from the tonsils and adenoids. They should be removed in all cases, and at least 80 per cent of them will recover after the procedure (according to Skillern). The sinuses are frequently diseased at the time of the tonsillectomy and account for those cases that are only temporarily improved because of better drainage. Removal of tonsils and adenoids by producing better drainage would naturally reduce susceptibility to sinus infection. One could account for the unimproved or temporarily improved cases because of long delayed operation, allowing chronicity to intervene. In those cases surgical intervention in the sinus will result in a cure.

A careful investigation of this subject leads me to these conclusions:

(1) Routine examination will reveal an unexpected large number of cases of paranasal sinus disease.

(2) Post-mortem statistics, even though at variance, show a large percentage of sinus infection.

(3) The diagnosis is too frequently made after secondary damage has resulted.

(4) Recurrent colds suggest sinus investigations.

(5) The sinuses develop in early fetal life and are of clinical importance soon after birth.

(6) Paranasal sinus disease is of interest to all practitioners of medicine.

(7) Sinus disease is common in children.

(8) The most common source of infection is from tonsils and adenoids.

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Skillern: Diagnosis and Treatment of Sinusitis in Infants.

404-407 Blount Building.

DISCUSSION (Abstract)

Dr. J. J. Shea, Memphis, Tenn.—From ancient time until the present, acute and chronic infections have existed in the upper respiratory tract. Formerly they were called rhinitis, and we were taught the symptoms and treatments of hypertrophic rhinitis, and of atrophic rhinitis, and of rhinorrhea, but today we appreciate the fact that the membrane of the nares is the show window for the sinuses, and every rhinologic examination has as its fundamental basis a study of the accessory sinuses. The recent epidemic of influenza was thought by many to have been primarily a sinus infection, and subsequently a septicemia. Whether this deduction is correct or not, we are seeing five cases of sinus infection now, where we saw one of the disease prior to the epidemic.

In St. Peter's Orphan Asylum in Memphis, we have watched the progress of various infections as related to children, and we are becoming more and more impressed with the view that the paranasal sinuses and ears of children are the beginning points of most of their diseases. The essayist quotes St. Clair Thompson that the antrum is infected from 20 to 33 per cent of times by the teeth. I believe that many of our dental sinus cases are the reverse, that is, the sinuses are diseased and in turn produce the dental infection. The patient who is suffering from a chronic sinus disease will readily fall a victim to pyorrhea. Maybe both of the diseases are due to his low resistance to suppurative infections.

I cannot agree with the statement of Dr. Beck that unilateral sinus infection is four times as frequent as bilateral if we consider the ethmoidal cells as well as the antra. The sphenoidal sinus develops in the remnant of the posterior portion of the cartilaginous nasal capsule, which is converted into the future nasal bone (Davis, page 160, Figure 11). The acute colds of infancy and childhood are more than simple rhinitis and involve the paranasal sinuses. If the sinuses remain healthy, they will follow in their development a definite cycle. At birth the ethmoidal cells are anatomically and clinically present. The frontal sinus is formed by the migration of an anterior ethmoidal cell into the frontal bone. This migration should begin during the second year of life. The growth and development of the ethmoidal cells and the frontal sinus is influenced by recurrent mild infections or a single severe infection. If the development is hindered or arrested, there will be a persistent infantile sinus. If this is borne in mind when examining roentgenograms, one is impressed with the fact that a large proportion of our patients have suffered sufficient infections to prevent the normal development of their sinuses.

Infections of the sinuses are more prevalent than we have heretofore believed.

Book Reviews

An Introduction to Objective Psychopathology. By G. V. Hamilton, M.D., Director of Psychobiological Research, Bureau of Social Hygiene, Inc., New York City. 354 pages. St. Louis: C. V. Mosby Company, 1925. Cloth, $5.

Yerkes, professor of psychology at Yale, says of this book: "Though little known and less understood by psychologists and psychopathologists, Hamilton's discoveries are undoubtedly of fundamental and far-reaching importance. I am old enough to be rash on occasion, so I venture to predict that he will presently find himself the leader of a school of psychopathology which will as importantly modify our current conceptions of reaction tendencies and their relations as has psychoanalytic method our notions about mental content."

Hamilton introduces his subject by reporting 200 cases, which occupy more than half the book. These are well but briefly given, and the methods described are clear and brief enough to appeal to the general practitioner.

His views seem sane, and of some practical medical significance. His accounts of his own experiments with animal behavior and those of others bear very directly upon his theories. He presents psychopathology in an agreeable and comprehensible form for physicians, any of whom will profit by reading the book.

Three Problem Children. Narratives from the Case Records of a Child Guidance Clinic. 146 pages. New York: Joint Committee on Methods of Preventing Delinquency. Cloth, $1.

This is a description of the diversion to more normal paths of three school children who were apparently in the way to become serious social problems. Practical application of psychiatric methods is seen here at its best.

The Surgical Clinics of North America (issued serially, one number every other month). Vol. VI, No. 1 (Philadelphia Number, February, 1926). 325 pages, with 136 illustrations. Philadelphia and London: W. B. Saunders Co. Per clinic year (February, 1926, to December, 1926). Paper, $12; cloth, $16 net.

An extensive article upon spinal anesthesia describes the value and technic of this procedure. "One-half to one grain of a drug which, when swallowed in capsule, produces effects so slight as to be detected with difficulty, when introduced into the dura produces complete analgesia with muscular relaxation of the lower half or two-thirds of the body, lasting 40-90 minutes, and then passes off without evidence of residual toxemia."

A case of thoracoplasty for tuberculosis of the lungs is given. Fractures, gynecological conditions, urological and general abdominal surgery receive notice. One wonders occasionally just how and why the authors and subjects were chosen. For example, there is a short very general article upon protein therapy for pelvic infection, which compliments injections of "aolan," a dry skim milk preparation.

The pages contain much that is worth while from a surgical standpoint, and very little of which criticism could be made.

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C. P. LORANZ, Secretary-Manager

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EDITORIAL DEPARTMENT

SOUTHERN MEDICAL ASSOCIATION
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TETANUS IN CIVIL PRACTICE

During the World War when the use of preventive vaccines upon a large scale could be enforced, every wounded soldier received tetanus antitoxin as soon as possible after his injury.[1] In peace times Government reports show the number of deaths from tetanus infection in the United States to be about fifteen hundred per year. According to Wainwright,[1] only twenty per cent of these cases are industrial, that is, occurring around railroads, mines, mills and factories. Farm machinery and tools cause nearly as much infection as all other classes of machinery combined. Another fact observed is that there are more cases of tetanus infection in warm weather than in cold. Of a large number of industrial surgeons to whom Wainwright sent questionnaires, only fourteen per cent reported routine use of tetanus antitoxin in the treatment of wounds.

Matas[2] has stated that the human intestinal tract may be a source of infection, and that if a patient, who has eaten lettuce or other raw vegetables three or four days before, is to have an abdominal operation, prophylactic antitoxin should be given. By other workers[3] an enormous number of tetanus spores were demonstrated in the feces of a patient who had been on practically sterile food in the hospital for one hundred and five days. Bauer and Meyer,[4] who have recently made a study of human intestinal carriers of tetanus spores in California, report that of four hundred and eighty-seven fecal specimens examined, 24.6 per cent contained tetanus spores. This is a very large percentage of carriers. Sex, age, and occupation apparently played no part in the distribution. Specific antibodies for the organism, such as antitoxin and agglutinins,[5] have been found in the blood of carriers. Bauer and Meyer suggest that on account of the general distribution of tetanus spores in top soil, they must be frequently ingested with food, and that whether the bacillus takes up its habitat, grows and multiplies in the alimentary tract, perhaps depends upon the intestinal flora, which may be symbiotic to the tetanus bacilli in one person and antagonistic in another. The microscopic picture, they say, of a fecal culture of a tetanus carrier differs from that of a non-carrier.

In regard to the treatment of recognizable cases with anti-tetanus serum and other medicaments, there is some disagreement. A British surgeon[1] investigating the subject in 1918 said that there did not seem to be any statistical evidence that serum given therapeutically had a marked effect on the rate of mortality. The trend of opinion seems to be today that massive doses of antitoxin immediately after the appearance of symptoms of the disease lower the mortality rate. There is some disagreement as to the method of administration. Wainwright[1] says that intraspinal injections of the serum are useless, and that the intravenous route is the route of choice. Poer,[2] in this issue of the JOURNAL, says:

1. Wainwright, J. M.: Tetanus: Its Incidence and Treatment. Arch. Int. Med., 12, p. 1062, May, 1926.
2. Matas, Rudolph, quoted by Poer, J. M.: Tetanus. S. M. J., p. 456, this issue.
3. Ten Broek and Bauer: Jour. Exper. Med., 36, p. 261, 1922, quoted by Bauer and Meyer (q. v. i.).
4. Bauer, J. H. and Meyer, K. F.: Human Intestinal Carriers of Tetanus Spores in California. Jour. Inf. Dis., 38, p. 295, April, 1926.
5. Ten Broek and Bauer: J. Exper. Med., 37, p. 479, 1923, quoted by Bauer and Meyer (q. v. s.).

"Intraspinous methods seem to have given the best per cent of recoveries. However, for many reasons the intravenous is the method of preference."

There is some difference of opinion as to the proper sedative to use.

Methods of growth and the life habits of the tetanus bacillus, Clostridium tetani according to the new terminology, are undoubtedly much more accurately understood than the means of combating the infection once it has fully developed in a human being. In civil practice it is not feasible to administer tetanus antitoxin for every slight injury. It is impossible to foretell the development of many cases of tetanus, even if they are seen early, yet terrible blame falls to the lot of any physician who allows a patient under his care to develop tetanus. The dispute over the imperativeness of routine preventive treatment, and over methods of treatment after the development of symptoms, go to show how much of an art medicine still is. With increasing efficiency of public health measures, increased natural resistance of the human race, and education of the laity, the three great hopes of preventive medicine, fewer cases of actual development of the infection will occur.

FERTILITY AND CONTRACEPTION

Last year's birth rate in New York State, 20.6 per 1,000 population, was the lowest on record.[1] The movement of the birth rate in New York, which may be taken as in some sense an index of the national rate, may be shown to vary with the nationality and number of immigrants, the birth rate being inversely related to the economic and cultural level of the population. Higher birth rates occur among immigrants from Italy, Poland, Russia and Austria than among those from Germany, Ireland, England, Scotland, Wales, Norway, Sweden and Denmark, and the rate from these latter countries is still twice as high as that of the native-born population.

The Malthusian doctrine that war is the necessary and inevitable result of over-population, and of the natural human birth rate, is well known. Of late much attention has been called to the numbers of mentally unfit disclosed by the draft in America. Of the white men who applied for military service, one out of every four was said to be a moron.[2]

Various methods have been advocated for improving the quality of our future population by disseminating knowledge of birth control, or by compulsory sterilization of the unfit. In England, discussion of means of contraception is free and general. In America, less interest of the medical profession appears to have been aroused in the subject. The physician, however, is constantly asked to interfere with nature to increase fertility in women who do not conceive, and to limit it in the more prolific, or the diseased. In matters of fertility and sterility, women in no country are satisfied with their inborn talents.

The concensus of opinion is that there is no thoroughly satisfactory and hundred per cent dependable method of birth control now available to the population. From studies upon German officers and their wives during the World War, it appears that there is a peak of fertility which occurs about the twelfth day after the beginning of the menstrual period; and that immediately before a menstrual period conception is rare. Dickinson,[3] in the *American Journal of Obstetrics and Gynecology*, reviews the animal experimentation that has to do with fertility and sterility.

It has been known that female rats and other animals may be rendered temporarily sterile by injections of spermatozoa. An Abderhalden reaction to testicular protein has been described regularly following coitus, and it has been suggested that the sterility commonly observed in prostitutes may be due to excessive absorption of sperm from the vagina and resulting sensitization.

Fogelson,[4] in a series of experiments with

1. Health News, New York State Department of Health, 3, No. 10, March 8, 1926.

2. Keller, D. H.: Marriage Laws. S. M. J., 19, p. 194, March, 1926.

3. Dickinson, R. L.: Sterility-Fertility Studies in Animals and Their Bearing on Human Problems. Amer. Jour. Obst. and Gyn., 10, p. 51, Jan., 1926.

4. Fogelson, S. J.: The Non-Specific Antigenic Effect of Spermatozoa Upon Fertility. Surg. Gyn. and Obst. 42, p. 374, March, 1926.

rats, found that, although the average young female rat produces her second litter usually five and a half weeks after the first, those whom he sensitized with injections of sperm produced their second litter an average of fourteen weeks after the first. In the serum of the injected rats, precipitins for spermatozoa could be demonstrated. The females could be sensitized as well with sperm from another species as with rat sperm, with a resulting period of sterility.

Fogelson concludes, as have other writers, that a contraceptive technic with these facts as a definite scientific basis may soon be available.

INFECTION WITH THE ORGANISM OF NEUROSYPHILIS

One often sees in clinical literature statements and case evidence that an individual who contracts syphilis from a neurosyphilitic develops neurosyphilis. These cases are offered as proof that different strains of Spirocheta pallida exist. Alfred Gordon,[1] in a paper entitled, "Conjugal Syphilis of the Nervous System," says:

"There is a great possibility, or even probability, that we are dealing with a neurotropic affinity of the virus which infects the conjugal couple. * * * We can not ignore the important facts * * * that the treponema isolated from paretic individuals is not biologically identical with the treponema taken from chancres and from the mucous patches of ordinary cases of syphilitic lesions."

Gordon refers to German work in which twelve rabbits were inoculated with emulsions of fragments of cerebral tissue from twelve paretic patients, and evidence was accumulated which favored the conception of the duality of the treponema in syphilis, that is, the conception that there are distinct neurotropic and dermotropic strains. Gordon appears to believe in the existence of a treponema, the virus of which has a special elective affinity for the central nervous system.

"It is legitimate to admit that the neurotropic microorganism may be at first identical with the dermotropic one, but ultimately after having an intracerebral existence more or less prolonged, it acquires the special characteristics mentioned above."

Gordon here is begging the question, or admitting the transmutability of bacterial species. He also says:

"We are in possession of many clinical observations in which the specificity of the neurotropic virus is evident in a large majority of cases."

In clinical medicine so many variables enter into every series of cases that conclusions may be drawn with difficulty. Kolmer, Wilkes-Weiss and Richter[2] have attempted a laboratory demonstration of the different strains. They injected rabbits with six strains from different sources of Spirocheta pallida, and later examined each of the immune sera of the several rabbits by complement-fixation and agglutination tests against the six different strains as antigens. No serum possessed unusual or specific complement-fixing properties for its own or homologous antigen. The tests did not indicate immunologic specificity on the part of any of the strains of Spirocheta pallida employed. Kolmer and his associates believe that the localization of the spirochete and the subsequent course of the disease are largely influenced by the virulence of the organism, method of inoculation, and the susceptibility of the host and efficiency of his defensive reaction. In human beings also, they think, there is no question involved of strain specificity or selective tissue affinity of the infecting spirochetes. The course of the disease depends not upon which of two distinct organisms invades the host, but upon the virulence of one organism and the host's resistance to it.

The work of Kolmer and his collaborators may show merely that the feeding habit of the particular spirochete bears no relation to its complement-fixing properties. However, if anyone

1. Gordon, Alfred: Amer. Jour. Syph., 10, p. 201, April, 1926.

2. Kolmer, J. A.; Wilkes-Weiss, Dorothy; and Richter, C. A.: Are There Immunologic Strains of Spirocheta Pallida? Jour. Inf. Dis., 38, p. 378, April, 1926.

ever acquires a form of syphilis other than neural from a paretic, that should destroy the claim of specificity of the organism. Specificity is more easily disproved than proved.

One of the reasons that the organism of syphilis is so resistant to treatment is that it is not localized by the body. It is able to feed and multiply on practically any and all the tissues of the body. The Klebs-Loeffler bacillus thrives mainly in the throat; the gonococcus, in the urogenital tract; the bacillus typhosus, in the alimentary canal. The body has not the power of preventing the spread of the Spirocheta pallida and overpowering it, and there is no organ which the one variety of spirochete apparently has not been known to attack.

Southern Medical News

ALABAMA

Deaths

Dr. Joseph Albert Pettus, Athens, aged 80, died April 6 of organic heart disease.

Dr. W. H. Cryer, Birmingham, aged 40, Superintendent of the Alabama Tuberculosis Sanatorium, died recently from acute nephritis at the sanatorium.

Dr. D. C. Donald, Pineapple, aged 45, died suddenly April 21 of heart disease.

ARKANSAS

Boone County Medical Society has elected Dr. G. W. Floyd, President; Dr. G. I. Jackson, Vice-President; Dr. D. L. Owens, Secretary-Treasurer.

Pope County Medical Society has elected Dr. H. V. H. Stroupe, President; Dr. H. S. Drummond, Vice-President; Dr. William P. Scarlett, Secretary-Treasurer.

The second annual meeting of the Woman's Auxiliary of the Arkansas Medical Society was held May 18-20 in connection with the Arkansas Medical Society.

Deaths

Dr. William Franklin Baugh, Conway, aged 71, died March 4 of angina pectoris.

Dr. Daniel A. Pelton, Forrest City, aged 60, died March 29 of angina pectoris.

Dr. Robert G. Davis, Hot Springs, aged 55, died April 9.

DISTRICT OF COLUMBIA

Efforts are being made by school officials and members of the Board of Education of the District of Columbia to have Congress enact legislation placing school medical inspection in the hands of the school authorities of the District instead of in the District Health Department. The Monday Evening Club, a civic organization, advocates a large medical inspection program in the schools and has made a survey of this work in the District schools as compared with schools of other cities throughout the country. The survey shows that Washington is behind other cities in the work of medical inspection in the public schools.

The Royal Anthropological Institute of Great Britain announces that the Huxley Memorial Medal for 1927 will be conferred on Dr. Ales Hrdlicka, Washington, who will go to London in the fall to deliver the Huxley lecture and to receive the medal. This is said to be the second time in twenty-six years that an American has received this award. Prof. William Z. Ripley, Ph.D., of Harvard University, won the Huxley Medal in 1908. Dr. Hrdlicka is curator of physical anthropology at the U. S. National Museum and has conducted anthropologic expeditions since 1898 in this and other countries.

Dr. Oscar B. Hunter, Assistant Dean and Professor of Bacteriology and Pathology, George Washington University Medical School, was chosen by the Medical Society of the District of Columbia to deliver the lecture of the Kober Foundation at Gaston Hall, Georgetown University, March 28.

Dr. Arthur G. Coumbe, Washington, was recently appointed Manager of the U. S. Veterans' Bureau office in Honolulu, Hawaii.

Dr. William Calhoun Stirling, Jr., Washington, has been appointed Associate Professor of Genito-Urinary Surgery at Georgetown University Medical School.

Deaths

Dr. John Tait, Washington, aged 98, died February 24.

FLORIDA

At the recent meeting of the Florida State Medical Association which was held in Gainesville, Dr. H. Mason Smith, Tampa, was elected President; Dr. Fred J. Waas, Jacksonville, First Vice-President; Dr. J. M. Dell, Gainesville, Second Vice-President; Dr. A. B. Fort, Miami, Third Vice-President; Dr. Shaler Richardson, Jacksonville, Secretary-Treasurer. The next meeting will be held in West Palm Beach.

The Woman's Auxiliary of the Florida Medical Association was organized at Gainesville May 5. The following officers were elected: Mrs. W. Lassiter, Gainesville, President; Mrs. A. H. Freeman, Ocala, Vice-President; Mrs. M. M. Hannum, Eustis, Secretary-Treasurer; Mrs. G. C. Tillman, Gainesville, Corresponding Secretary.

Palm Beach County Medical Society has elected Dr. R. O. Cooley, President; Dr. A. R. Miller, Vice-President; Dr. Wilbur O. Arnold, Secretary-Treasurer; Drs. George M. Dawson, Alice Miller and Jay A. Powell, Board of Censors.

A Municipal Hospital is being constructed at Delray to be made of several units. The first unit will cost $25,000.

Dr. Tom A. Williams, Washington, D. C., has moved to Miami.

Dr. Simon E. Driskell, Jacksonville, was recently appointed a member of the State Board of Medical Examiners.

GEORGIA

Clarke County Medical Society has elected Dr. J. S. Stewart, Jr., Athens, President; Dr. J. D. Applewhite, Athens, Vice-President; Dr. Thos. B. Gay, Athens, Secretary-Treasurer.

Dooley County Medical Society has elected Dr. E. B. Davis, Byromville, President; Dr. L. H. Bishop, Unadilla, Vice-President; Dr. F. E. Williams, Vienna, Secretary-Treasurer.

Leon Moye Medical Association (Toombs, Tattnall and Montgomery Counties) has elected Dr. J. E. Mercer, Vidalia, President; Dr. C. W. Findley, Vidalia, Secretary.

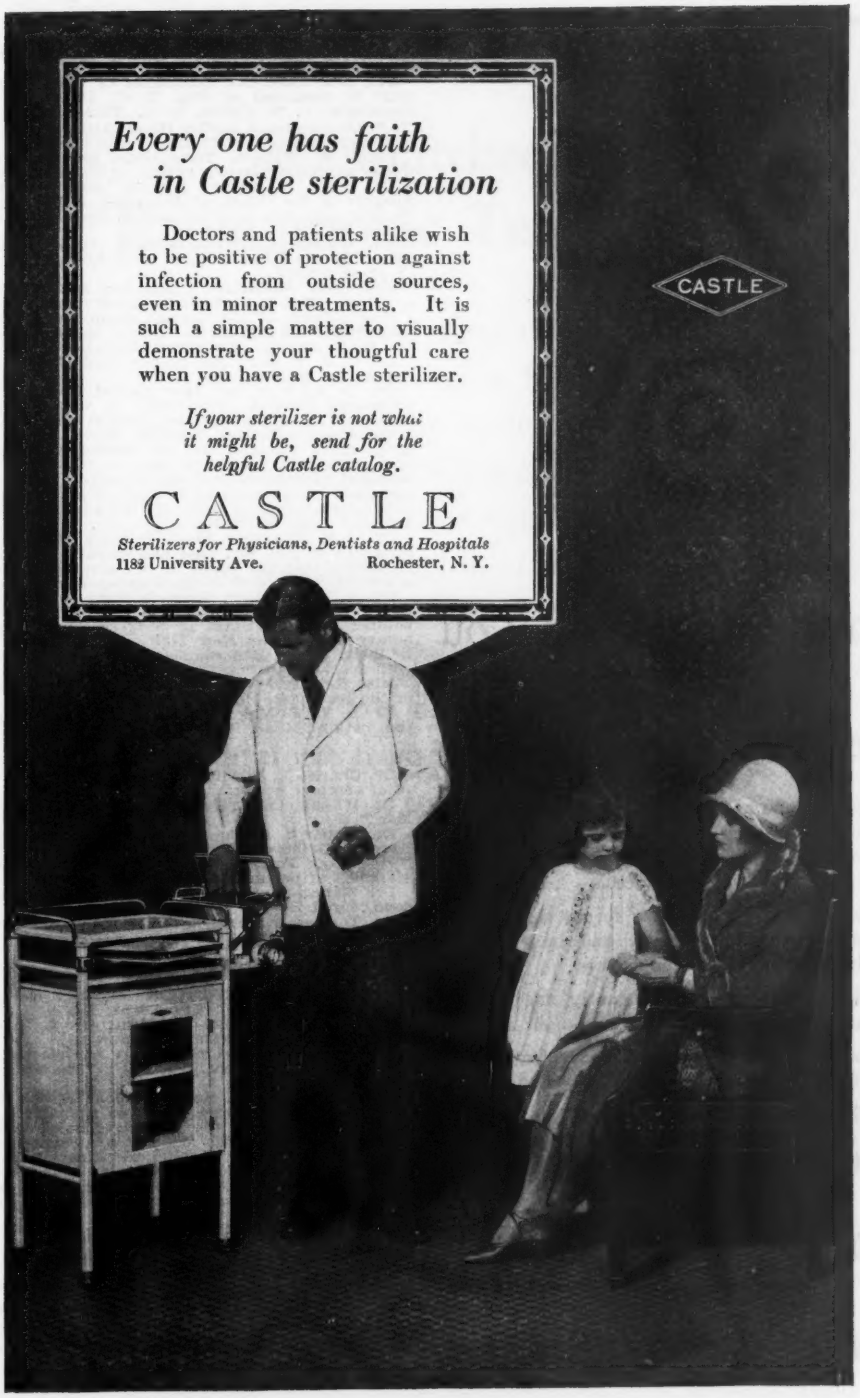
Ninth District Medical Society has elected Dr. Edson W. Glidden, President; Dr. Charles B. Almond, Vice-President.

Stephens County Medical Society has elected Dr. W. M. Fresh, Toccoa, President; Dr. E. F. Chaffin, Toccoa, Vice-President; Dr. C. L. Ayers, Toccoa, Secretary-Treasurer.

Taliaferro County Medical Society has elected Dr. T. C. Nash, Philomath, President; Dr. John A. Rhodes, Crawfordville, Secretary-Treasurer.

Toombs County Medical Society has elected Dr. J.

(Continued on page 34)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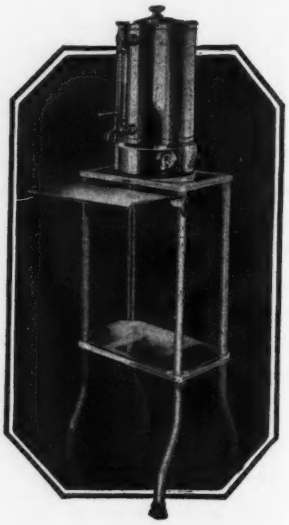

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(Continued from page 500)

E. Mercer, Vidalia, President; Dr. I. E. Aaron, Lyons, Vice-President; Dr. W. W. Odom, Lyons, Secretary-Treasurer.

The new Executive Committee of the Grady Hospital is composed of Drs. T. C. Davidson, H. R. Donaldson, L. W. Childs, E. C. Thrash, Arch Elkin, T. P. Goodwyn and Joseph Hines, Atlanta. Dr. Hines is Chairman and Dr. Thrash, Vice-Chairman.

Dr. J. W. Wallace, Thomasville, has taken up his duties as County Health Officer of Thomas County.

Dr. Allen H. Bunce, Atlanta, was elected Vice Speaker of the House of Delegates of the American Medical Association at its annual meeting in Dallas, Texas, in May.

The Waycross Hospital is being remodeled and repaired by the Atlantic Coast Line Railroad at a cost of about $18,000.

The Good Samaritan Clinic has opened its new quarters. This is a charitable institution.

New officers of the Georgia State Health Officers Association are Dr. C. L. Ridley, Macon, President; Dr. H. L. Akridge, Brunswick, Secretary-Treasurer.

Dr. C. J. Welborn has been elected County Health Officer for Hall County.

Dr. D. B. Ware has been elected Manager of the Fitzgerald Hospital, Fitzgerald. It was through the efforts of Dr. Ware that the hospital was built.

The Frances-Berrien Hospital, Rome, will soon undergo many changes, will be completely reorganized and everything necessary done to comply with the standard requirements of the American Hospital Association. Announcement is made of a new fire-proof annex, new operating room, and the addition of laboratory and x-ray assistants.

Dr. C. H. McArthur, Rome, is doing special work in St. Louis on eye, ear, nose and throat preparatory to practicing that specialty. It is announced he will be a member of the staff of the Frances-Berrien Hospital.

Dr. A. H. Dellinger, Rome, is doing special work at the New York Polyclinic Hospital, having been appointed First Assistant in Surgery during his temporary residence in New York. He expects to return to Rome in the late summer to resume his practice with special attention to surgery.

Miss Estelle Bowers has been made Superintendent of the Savannah Hospital, Savannah.

Dr. D. W. F. Maloy and Miss Clara Janett Bullington, both of Milan, were married February 22.

Deaths

Dr. Charles F. Fickling, Butler, aged 55, died March 16 of cerebral hemorrhage.

Dr. William Calvin Jarnagin, Atlanta, aged 75, died March 30.

Dr. Morris S. Cohen, Fitzgerald, aged 60, died February 19 at Cleveland, Ohio, of cerebral hemorrhage.

Dr. Frank Forrest Floyd, Statesboro, aged 50, died March 11 of pneumonia.

Dr. Wallace Mathews, Quitman, aged 58, was found dead March 11.

Dr. Thomas N. Courson, Devereaux, died March 9.

KENTUCKY

Fleming County Medical Society has elected Dr. Thos. Ribelin, Elizaville, President; Dr. A. S. Robertson, Flemingsburg, Vice-President; Dr. J. B. O'Bannon, Mt. Carmel, Secretary-Treasurer.

Metcalfe County Medical Society has elected Dr. P. W. Bushong, President; Dr. H. R. Vansant, Secretary-Treasurer.

Dr. W. M. Elliott, Superintendent of the Central State Hospital, Lakeland, has been transferred to the Superintendency of the Feeble Minded Institute, Frankfort, and Dr. W. W. Durham, Superintendent of the Western State Hospital, Hopkinsville, has been appointed Superintendent of the Lakeland Hospital. Dr. Thomas L. Taylor resigned as Superintendent of Central State Hospital to accept a hospital position in Hawaii.

Deaths

Dr. William V. Norris, Corydon, aged 82, died March 17 of influenza and pneumonia.

Dr. Pattie Alonzo Moore, Oakton, aged 55, died March 8 of carcinoma of the liver.

Dr. John T. Wallingford, Covington, aged 68, died in March at Brentwood Heights, Calif., of acute myocarditis and hypostatic pneumonia.

(Continued on page 36)

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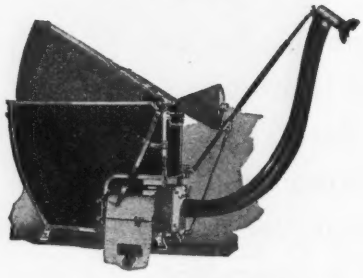

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(Continued from page 34)

Dr. Shelby Harrison Kelsay, Cropper, aged 46, died March 14 of penumonia.

Dr. Llewellyn Powell Durrett, Louisville, aged 58, died in March at St. Anthony's Hospital, following an operation.

Dr. Samuel H. Martin, Frankfort, aged 45, died March 23 of heart disease.

Dr. Silas W. Patton, Catlettsburg, aged 79, died February 28 of senility.

Dr. Aden G. Lovell, Mount Vernon, aged 72, died March 11.

LOUISIANA

At the forty-seventh annual meeting of the Louisiana State Medical Society, which was held in Monroe, Dr. Stephen M. B. Blackshear, New Orleans, was elected President; Dr. Arthur A. Herold, Shreveport, President-Elect; Drs. James A. White, Alexandria, Courtland P. Gray, Monroe, and Remy G. Ducote, Bordelonville, Vice-Presidents; Dr. Paul T. Talbot, Secretary-Treasurer. The next meeting will be held in New Orleans.

The first unit of the Southern Baptist Hospital, New Orleans, was opened March 8. It has a capacity of 218 beds. When completed, the hospital will have a bed capacity of 800.

The New Orleans Anti-tuberculosis League's Clinics were well attended during February. The attendance of 1,011 reached a new high record. One hundred and thirty-three of these were new patients and of these twenty-two were found positive for tuberculosis, and thirty-seven were placed under observation. The League has three morning clinics under the direction of Dr. Julius M. Davidson, and four afternoon clinics under the direction of Dr. George S. Brown.

The Superintendent of Charity Hospital, New Orleans, reports that the John Dibert Tuberculosis Hospital, which was constructed as an associated unit, will be maintained without cost to the State. A new unit of 120 beds, made possible by public subscription, was opened last December.

MARYLAND

Plans have been completed for a research expedition to Central America under the leadership of William W. Cort, Ph. D., Professor of Helminthology, Johns Hopkins School of Hygiene and Public Health, for the purpose of improving control measures used to combat the hookworm. The expedition is part of a program of cooperation between the Department of Medical Zoology at Johns Hopkins and the International Health Board which has been carried on by Dr. Cort in various countries since 1921. The Commission will be divided into two groups, one going to Panama, the other to Nicaragua. One group sails from New Orleans early in June, and consists of Donald L. Augustine, S. D., Assistant Professor of Helminthology, Department of Comparative Pathology, Harvard University, Boston, and William A. Riley, Ph. D., Professor of Animal Biology and head of the Department, University of Minnesota, Minneapolis. The other group was to leave New York for Nicaragua the latter part of May and consisted of Norman R. Stoll, Sc. D., Associate in Helminthology at Johns Hopkins, and Marucie C. Hall, Ph. D., Chief, Zoological Division, Bureau of Animal Industry, U. S. Department of Agriculture. Dr. Cort will divide his time between the two groups to coordinate the work.

Arrangements have been completed for an exchange of professors between the Johns Hopkins School of Hygiene and Public Health and the London School of Hygiene and Tropical Medicine. Robert W. Hegner, Ph. D., Professor of Protozoology at Johns Hopkins University School of Hygiene and Public Health, left for London the latter part of March; Dr. John G. Thomason, Director of Protozoology at the London institution, has arrived in Baltimore. The exchange of professors, which will cover a period of about six months, is the result of an arrangement between Mr. Andrew Balfour, Director of the London School, and Dr. William H. Welch, Director of Johns Hopkins University School of Hygiene and Public Health, for furthering an exchange of ideas and comparing the personnel and methods of the two institutions. This change is the second to be made by the Johns Hopkins School of Hygiene and Public Health.

(Continued on page 38)

WHERE KNOX SPARKLING GELATINE HAS PROVED HIGHLY EFFECTIVE

*1. **In infant feeding for full digestion of milk and the prevention of curds, regurgitation, vomiting.**

2. For growth promotion in infant and child feeding.

3. In stubborn cases of malnutrition.

4. In the treatment of stomach disorders and intestinal putrefaction.

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THE first summer—the time of regurgitation, colic, diarrhea, malnutrition—may be successfully bridged by utilizing the protective colloidal ability of Knox Sparkling Gelatine in preventing the excessive curdling of the milk in the infant stomach.

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*FORMULA FOR INFANT FEEDING—Soak for ten minutes one level tablespoonful of Knox Sparkling Gelatine in ½ cup of cold milk taken from the baby's formula; cover while soaking; then place the cup in boiling water, stirring until gelatine is fully dissolved; add this dissolved gelatine to the quart of cold milk or regular formula.

For this purpose, as for all dietary uses, Knox Sparkling Gelatine is recommended because of uniform purity, produced under constant bacteriological control. No coloring, sweetening or flavoring—the purest of bone gelatine.

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(Continued from page 36)

The Lions Club, Baltimore, has dedicated a twenty-bed ward for crippled children at the Franklin Square Hospital, Baltimore.

Dr. Valcoulon Le Moyne Ellicott and Miss Mary Purnell Bould, both of Baltimore, were married April 5.

Deaths

Dr. William Edwin Burton, Baltimore, aged 63, died March 28 following a long illness.

Dr. Nelson Frank Wetmore, Tacoma Park, aged 73, died March 15.

Dr. William Garth Clopton, Baltimore, aged 48, died March 16 at the Massachusetts General Hospital, Boston, following an operation for carcinoma of the rectum.

MISSISSIPPI

Winona District Medical Association met in Grenada April 2. The following officers were elected: Dr. J. H. Brown, Eupora, President; Drs. W. D. Arnold, Ackerman, J. O. Ringold, Winona, F. B. Coats, Hardy, and V. V. Wallace, Carrollton, Vice-Presidents and Delegates; Dr. J. K. Avent, Grenada, Secretary-Treasurer.

Deaths

Dr. James W. Hardy, Winterville, aged 74, died March 20.

Dr. William Edward Sharp, Pascagoula, aged 54, died March 16.

MISSOURI

St. John's Hospital, St. Louis, has opened a new wing containing a modern pediatric department and attractive children's wards. Plans are being made to erect a new building for the School of Nursing.

At the recent meeting of the American Medical Association in Dallas, Texas, Dr. Jabez N. Jackson, Kansas City, was elected President-Elect.

Dr. Robert E. Crabtree was recently appointed Deputy Health Commissioner for Bates County.

(Continued on page 40)

A NEW MILK MODIFIER

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THE variation in the proportion of proteins, fats and sugars in human and cow's milk, makes the modification of the latter essential when using as an infant food.

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1. Offset the sugar deficiency in cow's milk.
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Here the oil from our various plants is thoroughly mixed in large blending tanks. This insures a uniform product throughout the year.

Just as the coffee roaster blends his coffees and the miller his wheat, the blending of cod liver oil is an important step in producing PATCH'S FLAVORED COD LIVER OIL.

The U. S. P. Assay.

Nearly four years before the U. S. P. Vitamin Assay became official, we were biologically testing each lot of PATCH'S FLAVORED COD LIVER OIL in our research laboratory, for your protection.

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(Continued from page 38)

Deaths

Dr. Nicholas Green Matthews, Owensville, aged 85, died February 26.

Dr. Kelley W. Travis, Princeton, aged 73, died March 7 of pneumonia.

Dr. Benjamin Robley Lennox, Sikeston, aged 67, died March 6 following a long illness.

Dr. E. D. Grigg, Verona, aged 88, died March 14.

Dr. Harold Jerard, Pleasant Hill, aged 73, died March 14 at the Research Hospital, Kansas City.

Dr. Charles Pinckney Hough, Jefferson City, aged 80, died March 12.

Dr. Cornelius M. England, Carthage, aged 84, died March 23 of senility.

Dr. Edmund Henry Mitchell, Bakersfield, aged 68, died March 30 of heart disease.

Dr. Frederick Converse Eastman, Lee's Summit, aged 83, died March 21 at Kansas City of influenza and myocarditis.

Dr. Rodney D. Ramey, Garden City, aged 70, died April 6 of heart disease.

Dr. John Albert Burtch, Coffey, aged 54, died March 9 at the Noyes Hospital, St. Joseph, of diabetes mellitus.

NORTH CAROLINA

On April 1 the State Board of Health started a survey of the proposed impounding basin of the Tallahassee Power Company. Engineers of the Board will cooperate with the health departments of Davidson and Rowan counties in collecting all data that might bear on the relation of the proposed dam to public health. It is reported that the dam will make the largest artificial lake in the world. When completed, it will have a shore line of more than 325 miles.

The Caldwell Hospital Company, Lenoir, of which Dr. Lester A. Crowell, Lincolnton, is President, has secured the property of the former Lincolnton Hospital, which will be remodeled and enlarged. Dr. Robert W. Petrie, Charlotte, is Secretary, and will assume the direction of the hospital about June 1.

(Continued on page 42)

Summer Months Bring Feeding Troubles!

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They come off without solvents.

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MOBILE :—: ALABAMA

(Continued from page 40)

Drs. William F. Elliott and Gordon B. Crowell are among the Directors.

The City of Tarboro has just ended its ninth year of owning and operating a Municipal Dairy. The city, which has a population of about 5,000, buys milk from farmers at 12 cents a quart, and after pasteurization, distributes it to consumers at 17 cents a quart. Since Tarboro has been operating the dairy, there has been a decrease in the amount of milk-borne disease.

The Thompson Memorial Hospital, Lumberton, has been opened. The institution is a monument to Dr. N. A. Thompson, the first surgeon to establish a hospital in Robeson County, and who met a tragic death in Fayetteville a few years ago. It replaces the original Thompson Hospital, which was destroyed by fire in 1924. Dr. Thomas C. Johnson, formerly associated with Dr. Thompson, will have charge of the professional direction, and the widow of Dr. Thompson is Vice-President of the corporation.

Dr. John W. MacConnell, Davidson, has been detailed as Commanding Officer of General Hospital No. 95, U. S. Army Reserve, at Columbia.

The Chamber of Commerce, Charlotte, has awarded a prize of $100 to Dr. Harvey P. Barret, one of the three citizens whose services to the city were outstanding during 1925.

Dr. H. C. Shirley has discontinued his association with the Charlotte Eye, Ear and Throat Hospital.

Dr. John Donnelly, Charlotte, has been appointed Superintendent of the New Mecklenburg County Tuberculosis Sanatorium, which will open June 1.

Davidson College has conferred the degree of D. Sc. on Dr. Andrew J. Crowell, Charlotte.

Dr. W. Grimes Byerly, formerly of Cooleemee, is now an Assistant Physician of the Staff of the North Carolina Sanatorium for the treatment of tuberculosis at Sanatorium.

Dr. Fred D. and DeWitt R. Austin have announced the opening of the Austin Clinic of Rectal Diseases, Urology, X-Ray and Dermatology, Independence Building, Charlotte.

Dr. Daniel R. Bryson has been re-elected President of the Chamber of Commerce, Bryson City.

(Continued on page 44)

CALCREOSE

Eliminates Objections to Creosote

CREOSOTE has long been used as an intestinal antiseptic as well as for its effect on pulmonary inflammations such as influenza, bronchitis, and tuberculosis.

Calcreose eliminates the usual objections to creosote. It is a chemical combination of creosote and hydrated calcium oxide from which the creosote is slowly liberated, thus aiding absorption and toleration.

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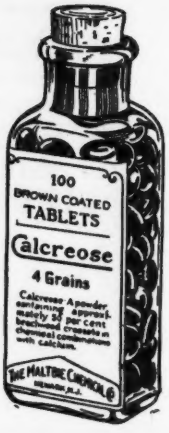

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PETROLAGAR supplies an emulsification of a pure mineral oil—which is not digestible or absorbable—with agar-agar.

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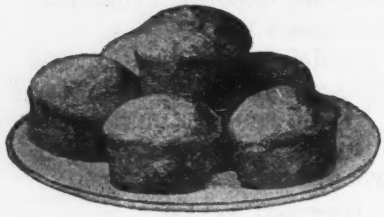

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Large Carton Flour *(30 days' supply)* $4.85

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(Continued from page 42)

Dr. Erasmus H. Evans Taylor, Morganton, and Miss Julia Barber, New York, N. Y., were married March 23.

Deaths

Dr. Lemuel Edwin Guion, Waxhaw, aged 43, died February 27.

Dr. Jesse York Fitzgerald, Indian Trail, aged 58, died March 12 of pneumonia.

Dr. George Burley Martin, Asheville, aged 43, died April 11 at a hospital in Oteen.

Dr. William Walter Barrett, Peachland, aged 61, died March 11 at the Anson Sanatorium, Wadesboro, of injuries received in a fall.

Dr. Virgil Newton Seawell, Faison, aged 86, died April 1.

OKLAHOMA

Tulsa Academy of Ophthalmology and Oto-Laryngology met March 15. The following officers were elected: Dr. J. Franklin Gorrell, President; Dr. Chas. H. Haralson, Vice-President; Dr. W. A. Huber, Secretary-Treasurer.

Washita County Medical Society recently conducted a Cancer Clinic at Cordell, at which 32 cancer patients presented themselves. Dr. E. S. Lain, Oklahoma City, conducted the clinic.

The Oklahoma Asthma and Hay Fever Laboratory, Oklahoma City, which is conducted by Dr. Ray M. Balyeat, has been renamed the Balyeat Hay Fever and Asthma Clinic.

Clinics for the crippled children of Wagoner and Cherokee Counties were held at Wagoner and Talequah, February 26-27, under the auspices of the Oklahoma Society for the Care of Crippled Children. Drs. S. R. Cunningham, Oklahoma City, and William Patton Fite, Muskogee, were in charge.

Dr. Harper Wright, Grandfield, has been elected President of the State Board of Medical Examiners.

Miss Edith Gatin has assumed the duties of Superintendent of the Hollis Hospital, Hollis.

(Continued on page 46)

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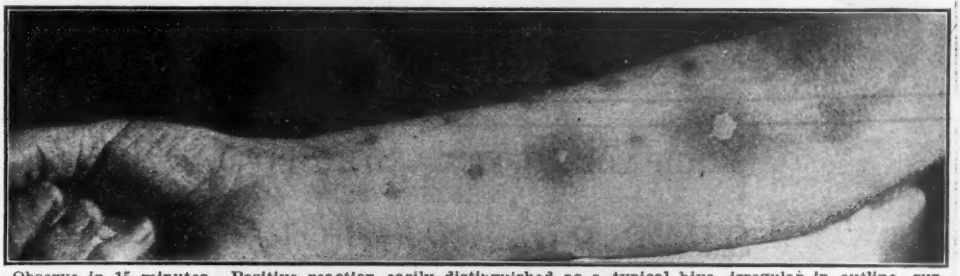

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(Continued from page 44)

Deaths

Dr. John T. Slover, Sulphur, aged 55, died March 1 following a long illness.

Dr. George A. Waters, Granite, aged 61, died February 9 after a brief illness.

SOUTH CAROLINA

At the seventy-eighth annual meeting of the South Carolina Medical Association at Sumter, April 6, Dr. George H. Bunch, Columbia, was elected President; Drs. Wm. C. Black, Greenville, Charles J. Lemmon, Sumter, and William L. Pressley, Abbeville, Vice-Presidents; Dr. Edgar A. Hines, Seneca, Secretary-Treasurer, re-elected. The next annual meeting will be held in Anderson.

The Lyle Hospital, Rock Hill, was recently opened. The hospital is under the management of Dr. and Mrs. David Lyle.

Deaths

Dr. Joe M. Owens, Cross Hill, aged 54, died March 22.

Dr. Fred Stroble Westmoreland, Spartanburg, aged 46, died March 5 at Vienna, Austria.

Dr. James Benjamin Padgett, Ruffin, aged 61, died March 23 at the Charles Ed'Dorn Hospital, Walterboro, of chronic nephritis and heart disease.

Dr. William Mitchell Love, Chester, aged 66, died March 26 of heart disease.

Dr. William James Dunn, Camden, aged 62, died March 12.

Dr. William Henry Holland, Ninety Six, aged 62, died March 7.

(Continued on page 48)

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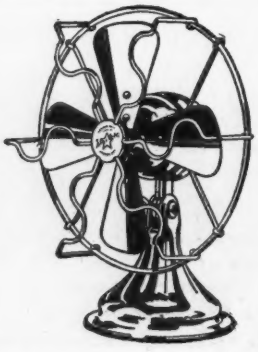

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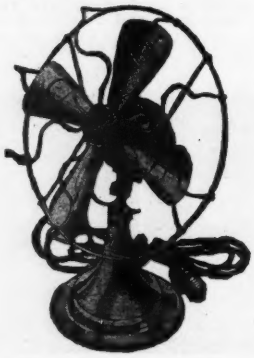

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(Continued from page 46)

TENNESSEE

The Memphis and Shelby County Medical Society celebrated its fiftieth anniversary May 13 at the University Club. A non-scientific program and a banquet were arranged.

The Board of Trustees of the Baptist Memorial Hospital, Memphis, plans to erect a nine-story annex to the present building.

Dr. Walter C. Klotz, Medical Director of the National Home for Disabled Volunteer Soldiers, Johnson City, has resigned, to accept a position on the faculty of Cornell University Medical School, New York. Dr. David Townsend, Associate Medical Director, will succeed Dr. Klotz, and Dr. Edward B. Frisbee, Chief of the Tuberculosis Unit of the Pacific Branch of the National Soldiers' Home, Sautelle, Calif., will become Associate Medical Director.

Deaths

Dr. Albert Benton Peck, Knoxville, aged 54, died April 2 of pneumonia.

Dr. Wilbur Gleason Ruble, Morristown, aged 52, died suddenly at his home April 27.

Dr. Newton M. Williams, Jackson, aged 77, died March 11 of chronic nephritis.

Dr. Walter Scott Dotson, Lebanon, aged 47, died March 13 at the Protestant Hospital, Nashville, of cerebral hemorrhage.

TEXAS

At the recent meeting of the American Medical Association, held in Dallas, Dr. Jabez N. Jackson, Kansas City, Mo., was elected President-Elect; Dr. J. O. McReynolds, Dallas, Vice-President; Dr. Allen H. Bunce, Atlanta, Ga., Vice Speaker of the House of Delegates. The next meeting will be held in Washington, D. C.

Lubbock-Crosby Counties Medical Society has elected Dr. J. W. Rollo, President; Dr. M. C. Overton, Vice-President; Dr. Allen T. Stewart, Secretary-Treasurer, all of Lubbock.

(Continued on page 50)

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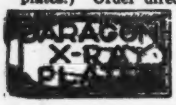

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(Continued from page 48)

Wood County Medical Society has elected Dr. W. T. Black, Quitman, President; Dr. T. B. Reed, Mineola, Vice-President; Dr. V. E. Robbins, Quitman, Secretary-Treasurer.

A conference of the Northeast Texas Medical Society was held at Tyler on March 26 for the purpose of inaugurating the Publicity and Enforcement Campaign.

Baylor University College of Medicine, Dallas, announces that it will establish a Department of Public Health Examinations in the Outdoor Dispensary of the University for the examination of apparently well persons, and that only persons entitled to free service will be admitted for examination. Beginning with the 1926-1927 session, all students admitted to the medical school will be required to submit to a complete health examination when admitted and annually until graduation. They will be required to be vaccinated against smallpox when admitted, and will be urged to submit to vaccination against typhoid fever. The work will be done under the direction of the Department of Bacteriology, Hygiene and Preventive Medicine, and comprehensive records will be kept on forms similar to those recommended by the American Medical Association for health examinations.

Work will soon begin on the eleven-story Medical Arts Building to be erected at Wichita Falls. The building will cost approximately $1,000,000.

Work has been started on the five-story Medical Arts Building to be erected at Corpus Christi.

A contract has been let for the erection of a four-story Medical Arts Building at Abilene. The building will cost approximately $50,000.

Dr. Joseph R. Frobese, San Antonio, has been appointed a member of the State Board of Health, succeeding Dr. Murff F. Bledsoe, Port Arthur, who resigned. Dr. Ralph Bailey, Gatesville, was appointed to the Board to succeed the late Dr. Edward L. Rose, Palestine.

An anonymous gift of $75,000 has been received from a white donor, to be applied on the building of a modern hospital for the negroes of Houston. The gift is to be supplemented by one from the city. I. M. Ter-

(Continued on page 52)

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(Continued from page 50)

rell, who has been connected witth the negro public schools of Fort Worth for 33 years, has been made head of this colored hospital. It is understood that the hospital will benefit from the Community Chest and will receive aid and counsel from the Harris County Medical Society.

Dr. Abraham Antweil, Fort Worth, and Miss Frieda Belle Maier, Lockhart, were married February 7.

Deaths

Dr. John Baxter McLean, Fort Worth, aged 73, died March 4 of pneumonia.

Dr. George D. Lain, Sanger, aged 65, died recently.

Dr. William F. Taylor, Fort Worth, aged 77, died in March of heart disease.

Dr. Stephen M. Applewhite, San Antonio, aged 74, died March 2 of pneumonia.

Dr. Charles Newton Powell, Deweyville, aged 57, died February 18.

Dr. Herbert Othello Darnall, El Paso, aged 48, died in March at the William Beaumont General Hospital.

Dr. Jerry A. Leeman, Pecos, aged 84, died March 21.

Dr. Jacob Edward Gilcreest, Ennis, aged 75, died March 18 of myocarditis.

Dr. Samuel O. Young, Houston, aged 78, died at St. Joseph's Infirmary February 16.

Dr. James G. Pope, Coleman, aged 56, died in March.

Dr. James P. Davis, Gary, aged 71, died March 16 at Nacogdoches of pneumonia.

Dr. Preston A. Peak, Greenville, aged 63, died March 10 following a long illness.

VIRGINIA

At the conference of the State Health Workers and the Virginia Public Health Association at Richmond recently, the following officers were elected: Dr. R. W. Garnett, Danville, President; Dr. P. M. Chichester, Clarendon, Vice-President; Dr. L. L. Williams, Surgeon of the U. S. Public Health Service, Secretary-Treasurer.

New officers of the Virginia State Board of Health

(Continued on page 54)

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(Continued from page 52)

are: Dr. William T. Graham, Richmond, President; Dr. Guy Harrigon, Richmond, Vice-President; Dr. Lawrence T. Royster, University, Secretary. Dr. Graham succeeds the late Dr. William M. Smith.

Southside Virginia Medical Association has elected Dr. F. C. Rinker, Norfolk, President; Dr. R. L. Raiford, Sedley, Secretary.

Rockbridge County Medical Society at a called meeting on March 22 elected Dr. E. P. Tompkins, Lexington, Secretary to succeed the late Dr. B. W. Switzer. Dr. Robert Glasgow, Lexington, is President.

The Seaside Cottage Sanatorium, Virginia Beach, has a new twenty-four room building, which was opened June 1. This is under the supervision of Drs. William L. Harris and Claiborne Wilcox. Dr. Cora Z. Corpening is Resident Physician.

It is reported that the $60,000 required to be raised for a hospital by the community of Farmville, for which the Commonwealth Fund will give $120,000, has almost all been subscribed. It is understood that the contract for the hospital will be let soon.

The Masonic Grand Lodge of Virginia will construct an infirmary and pavilion at Blue Ridge Sanatorium, Charlottesville. It is understood that Masons and members of their families will have preference on the waiting list in entering the institution.

The Shriners will erect a hospital in Richmond for crippled children on a site of about nine acres.

At the recent celebration of the twentieth anniversary of the Elizabeth Buxton Hospital, Newport News, the staff presented a memorial tablet of the late Dr. Edwin M. Newsom.

Dr. Sidney L. Scott was recently elected President of the Chamber of Commerce, Fredericksburg.

Dr. Edmund Madison Chitwood, Wytheville, has been elected Captain of the Medical Unit of the 116th Infantry, National Guard.

Dr. Alfred Bryson Greiner, Rural Retreat, has been

(Continued on page 56)

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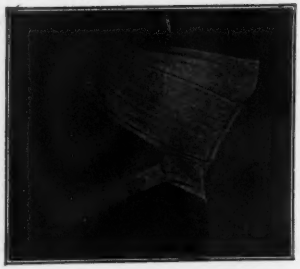

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KATHERINE L. STORM, M.D.,

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(Continued from page 54)

elected Second Vice-President of the Chamber of Commerce.

Dr. Roshier W. Miller, Richmond, has been elected President of the North Richmond Athletic Association.

Dr. Louis E. Fuller, Callands, was recently appointed a member of the School Board of Pittsylvania.

Dr. Gerald A. Ezekiel, Richmond, and Miss Julia May Sommers, Washington, D. C., were married February 22.

Deaths

Dr. Emory Hale Connelly, aged 44, died at Alberta, March 18 following the cutting of an artery in the leg.

Dr. George Ross, Richmond, aged 87, died in March in Los Angeles, Calif.

WEST VIRGINIA

Central West Virginia Medical Society was organized in Richwood, March 24. The following officers were elected: Dr. C. Fred Fisher, Richwood, President; Drs. J. B. Dodril, Webster Springs, and W. H. McCauley, Sutton, Vice-Presidents; Dr. Homer S. Brown, Sutton, Secretary-Treasurer.

The Central Tri-State Medical Society met in Huntington, May 6.

The stockholders of the Mountain State Hospital held their annual meeting in February. The following officers were elected: Dr. R. H. Walker, President; Dr. T. J. Casto, Vice-President; Dr. W. P. Black, Treasurer; Dr. J. R. Shultz, Secretary. The following directors were elected: Drs. J. Ross Hunter, George B. Kenney, E. R. Hatfield, M. I. Mendeloff, W. S. Shepherd, R. H. Walker, T. J. Casto, W. P. Black and J. R. Shultz. Dr. Hunter was elected Chairman of the Board. Dr. R. A. Ireland was elected Superintendent of the Hospital. Dr. M. V. Godbey was made an honorary member of the Board of Directors.

It is reported that there were about twenty deaths in the State in January and February due to measles; about 983 cases were reported in February, and twice that number reported in January.

Deaths

Dr. J. C. Hurst, Saxon, died suddenly March 19.

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INFANT DIET MEAD'S MATERIALS

Diarrheas of Infants

The usual season for Summer Diarrheas of infants is just around the corner! For several summers past physicians have found

MEAD'S CASEC

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useful in the treatment of the common fermentative diarrheas. A formula is suggested for the physician's consideration and approval:

Whole Milk.....10 ounces
Cold Water.....20 ounces
Casec (2 envelopes).....⅔ ounce

Mix the CASEC with enough of the cold water in a cup to make a thin paste. Add the paste to the balance of the water, pour in the milk, and heat the mixture over a slow flame to the boiling point, stirring constantly to avoid lumps. Allow the mixture to boil actively for 1 minute, remove from stove, cool, and divide into bottles sufficient for the 24-hour feeding.

Suggested Amounts to Be Given at Each Feeding Are as Follows:

Age Months	*Ounces Each Feeding*	*Number of Feedings in 24 Hours*
1	2 to 3	7
2	3 to 4	7
3	4 to 5	7
4	5 to 6	6
5	5 to 7	5
6 to 9	6 to 8	5
9 to 12	7 to 9	5

Infants under Four Pounds may require 8 feedings, 2 ounces each, in the 24 hours

In two or three days add 1 level tablespoonful of *Dextri-Maltose* No. 1, and increase one tablespoonful every other day until the baby is taking 5 or 6 level tablespoonfuls of *Dextri-Maltose* in the 24-hour Casec feeding.

The Casec feeding may be continued for 3 or 4 weeks, then a gradual return to the regular milk mixtures of either fresh milk or *Mead's Powdered Whole Milk*, with Dextri-Maltose additions, may be instituted.

Our Literature No. 109 entitled "Certain Types of Sick Infants" fully explains the use of CASEC in diarrheas.

Samples of Casec and copies of Literature No. 109 will be furnished immediately on request.

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THE importance of preventing rabies is fully appreciated by the medical profession for the reason that not a single cure of a well authenticated case of human rabies has ever been reported.

The prompt employment of Rabies Vaccine is imperative for the safety of the patient. Rabies Vaccine (Cumming), P. D. & Co., is a product that represents the antigenic principle of rabies virus, but since it contains no living virus it can be administered without risk of precipitating an attack of rabies. The doses are not numbered, for they are all alike; 2 cc. of a harmless vaccine by hypodermic injection; no more exacting technique than that.

Rabies Vaccine (Cumming), P. D. & Co., is made by the method devised by Dr. J. G. Cumming. A one per cent suspension of rabic brain tissue (from rabbits dying of rabies induced by an injection of fixed virus) is dialyzed against running distilled sterile water until the infectivity of the virus is destroyed. The safety of the finished product is assured by injections beneath the dura of rabbits and subcutaneously in guinea-pigs and mice. Sterility tests are also utilized to insure freedom from bacteria. The vaccine is standardized by weight so that 2 cc. of suspension, the contents of one of the syringe containers, contains sufficient material for one injection for an adult.

The safety and efficiency of Rabies Vaccine (Cumming), P. D. & Co., has been amply demonstrated by its employment in at least ten thousand cases of bites from rabid animals. The usual treatment consists of twenty-one injections—one injection daily for three weeks. A shorter course—one of fourteen injections only—suffices when the wound is only a slight scratch on the hands or lower limbs.

Rabies Vaccine (Cumming), P. D. & Co., is supplied in packages of seven 2-cc syringe containers, complete, with needles, each syringe holding one dose. Orders for a 21- or a 14-dose treatment should be sent direct to Detroit (the home office) or the nearest branch or depot.

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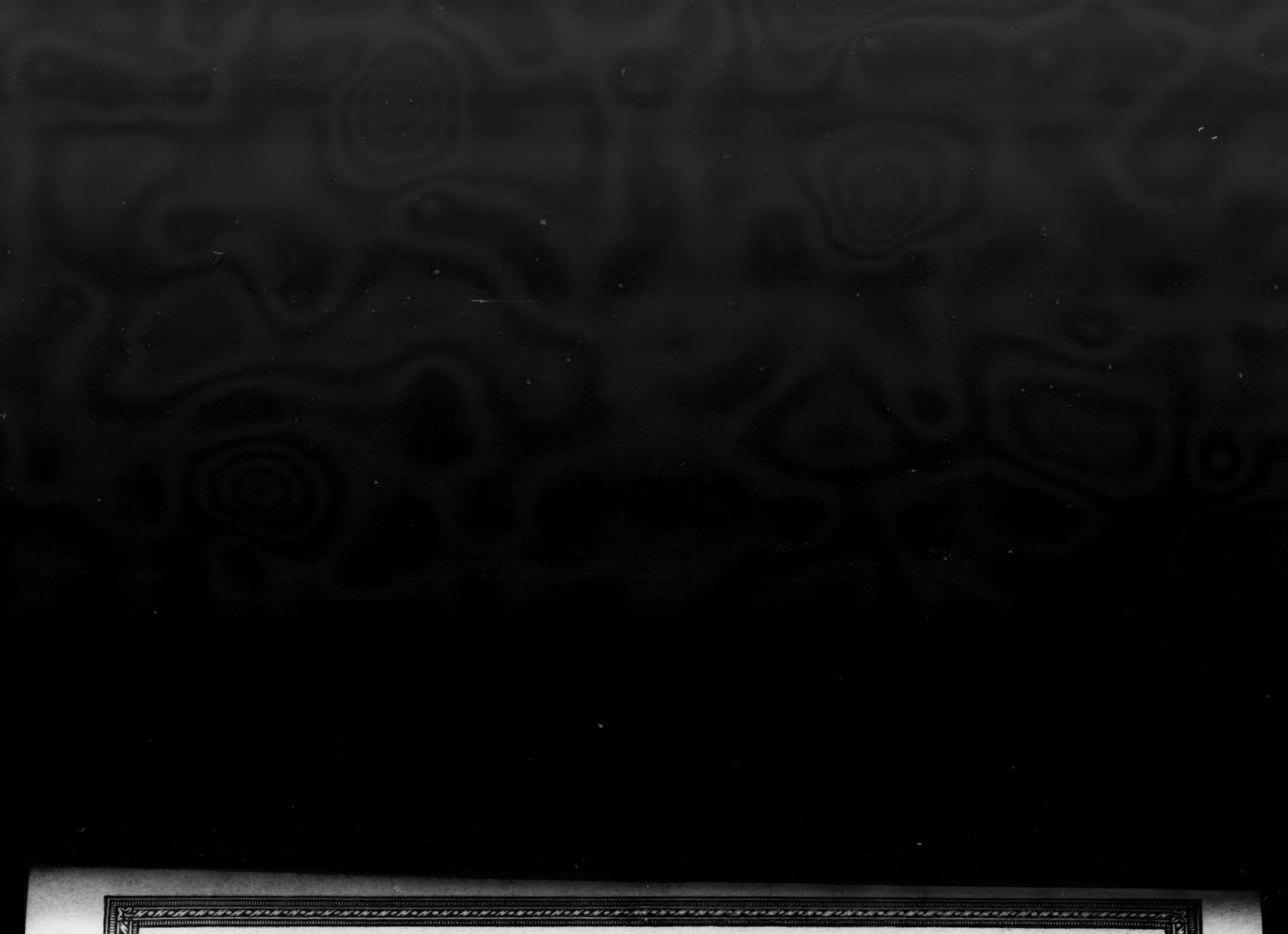
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